Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXII August 12, 1931 No. 10

Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

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Vol. XXII CHICAGO, AUGUST 12, 1931 No. 10

Thunder Bay Plant in Operation by Sept. 1

450 MEN ARE NOW EMPLOYED

Construction has been started on the largest structural-steel unit of the crushed-stone plant being erected at Alpena, Mich., by the Thunder Bay Quarries Co. Approximately 450 men are employed on the various units and it is hoped to have the plant completed some time this month. The latest unit to be started, the screening building, will be six stories high and will be the tallest structure in the group. Barring unavoidable delays, the company will be able to begin shipments of crushed limestone from Alpena by Sept. 1.

The project is located on an extensive site between Ford Av. and the shore of Thunder Bay. The quarry lies about a half-mile north, near the northerly city limits of Alpena. Tracks and a trestle lead from the quarry to the crushing building. Stone carried in cars from the quarry will be dumped into a gyratory crusher. In this crusher, the stone will be reduced to sizes small enough to be carried by belt conveyor to a secondary crusher building where it will be recrushed by a set of rolls. The stone will be carried by belt conveyor to the top of the screen house for sizing.

Six belts will carry the different sizes of stone to a storage bridge. At the storage bridge, three boom belts extend on either side, dropping the stone into storage piles. Underneath the storage piles, tunnel belt conveyors will carry the stone to a cross belt which will deliver the material to a belt paralleling the face of the dock. Connected with this belt, will be a shuttle conveyor which will move along the face of the dock delivering stone into the ship through hatches.

The capacity of the new plant will be 2,000,000 tons a year.

The channel from the dock out into Lake Michigan is being dredged in a direct line to a point of intersection with the channel of Thunder Bay River from where vessels will use the channel of Thunder Bay River out to its intersection with the lanes of ship travel on Lake Huron. Range lights will guide boats using the channel at night.

The company's dock will extend into Thunder Bay 650 ft. beyond the old shore line. The eastern side of the dock will be a rock dike. The western side, paralleling the channel, will be of steel construction. The space between the two is being filled with channel dredgings and quarry strippings.

Huge Silica-Sand Firm to Operate in Michigan

Plans for the organization of a $1,500,000 corporation to mine and ship silica sand from deposits located along the east shore of Munising Bay on upper Lake Michigan have been announced by W. I. Sallee of Milwaukee.

Mr. Sallee said his decision came after long investigation which proved the deposits at Munising to be among the best and largest in the United States.

Erection of a hydraulic plant for mining the sand, dock facilities for shipping, and storage plants and docks at Buffalo, N. Y., and Milwaukee are contemplated, Mr. Sallee declares.

Four New Lime Kilns at Bellefonte, Pa. Plant

Whiterock Quarries, Inc., of Bellefonte, Pa., recently began construction of four additional lime kilns to supplement its present equipment. The new kilns are of the shaft type and will increase the company's lime output about 80 tons daily, according to Ray Noll, general manager.

The company is at present experimenting with a new type of electrically-heated kiln. The tests are being made in coöperation with one of the foremost builders of electric furnaces.

Ford Motor Co. Acquires Michigan Slate Quarry

The Ford Motor Co. is reöpening an old slate quarry at Arvon, Mich., and will take out a considerable amount of slate for manufacture into shingles for use by the company. A boiler and pump have been installed and the water will be pumped from the old quarry pit. The pit is 400 ft. long, 80 ft. wide and about 60 ft. deep. The slate is dark blue and of first-class quality and shingles manufactured from it have been used on many public and private buildings in that vicinity.

Acquires Rights for New Cement Process

LOW TEMPERATURES EMPLOYED

The Eddystone Cement Corp. has been formed by E. R. Wilner, and offices have been established at 11 West 42nd St., New York, N. Y. The company has acquired the rights to manufacture cement by a new process, patented last December by Mr. Wilner.

The method of manufacture, as stated in the patent granted, consists in "heating separately lime and clay, shale or other silicious earths at a relatively low point, mixing the heated mixture, grinding to suitable fineness, and introducing a jet of water or steam into the mixture under agitation."

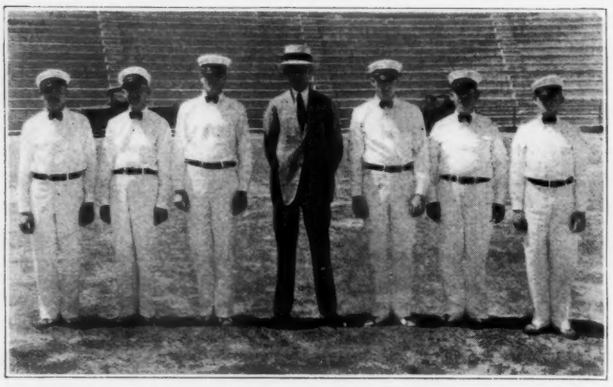
The above process is said to convert the silica to a chemically-active state, enabling it to unite chemically with the unabsorbed lime.

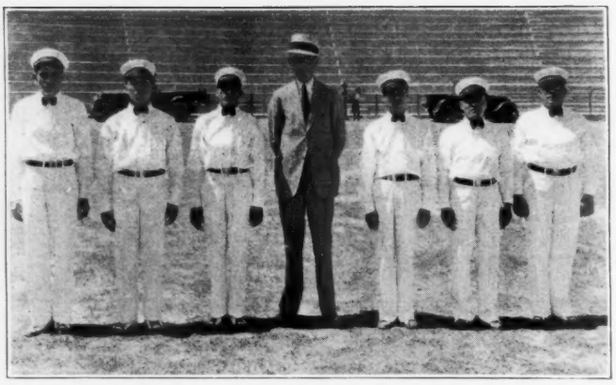
To produce the cement 77½ per cent. of clay or shale is heated separately to 800 deg. C. To this is added 22½ per cent. of lime, which has been heated separately to a temperature sufficient to drive off all the CO_2 gases which, depending upon different limes, will vary between 1,000 and 1,250 deg. C. The two ingredients are mixed together, ground to a fineness of 80 per cent. on a 200-mesh sieve, and then agitated with the addition of 8 per cent. of water or its equivalent in steam. Gypsum in small quantities (2 to 4 per cent.) may be added, if desired, to retard the setting time of the cement.

In its true form Eddystone cement is a masonry cement of low volume change and great plasticity, according to Mr. Wilner. It is planned, however, to produce high-early-strength cement by combining it with ordinary Portland-cement clinker and regrinding the mixture to the desired fineness.

New Pre-Mixed Concrete Plant at East St. Louis

The General Material Co. of St. Louis, Mo., has placed in operation another ready-mixed-concrete plant in East St. Louis. A 2-cu. yd. mixer is employed. The company markets its product under the brand name "Red-D-Mix."





The above photographs depict the crack first-aid teams of the Southwestern Portland Cement Co. These two teams—No. 1 (at the left) under the captainship of M. W. Coffey and No. 2 led by Capt. Frank Valdez—brought signal honors to the plant at the annual first-aid contest held in El Paso, Tex., recently. No. 1 team captured first prize and No. 2 team was sixth of all industries represented. Supt. H. E. Nichols is in the center of both pictures.

Gypsum Co. Names Jordan Manager of Advertising

The Universal Gypsum & Lime Co. has announced the appointment of H. E. Jordan as advertising manager with headquarters in the general sales department in Chicago. The re-organization of the company's advertising department is a further indication of the expansion plans which the company has been carrying out consistently during the past several months.

Mr. Jordan is not a newcomer in the building industry, having been associated with the Curtis Companies at Clinton, Ia., for several years. More recently, he has held executive positions in dealer promotion work with several national advertisers including the Studebaker Corp. of America and the Johnson Motor Co. of Waukegan, Ill.

Barges Carrying Cement to U. S. River Project

In fulfilling a contract for the purchase of 240,000 bbl. of cement from the Marquette Cement Manufacturing Co., the U. S. Government is dispatching barges to the company's plant at Cape Girardeau, Mo., to be loaded with 2,000 bbl. of cement each. The bulk of the cement is being taken to Caruthersville, Mo., and Osceola, Ark., for government work in the vicinity of these two points. At Caruthersville, a plant is ready for the manufacture of concrete slabs and other material to be used for paving and strengthening river banks. The government moved 30,000 bbl. of cement from the Cape Girardeau plant during July and plans to transport 100,000 bbl. in August.

International Salt Is Stable Income Producer

The International Salt Co. has acquired the Independent Salt Co., of New York, N. Y., through purchase of its capital stock. Independent Salt Co. is the oldest and largest merchandising concern in the metropolitan district, with warehouses located at waterfront points.

International Salt, in acquiring Independent, strengthens its position in the Greater New York market, since it will be possible henceforth to render better service by closer contact and more direct dealings with the trade. The present management and personnel of Independent Salt Co. will be maintained without change.

International Aspect at Road-Machinery Exhibit

New designs in road machinery and the latest developments in preparing road materials were the high lights at the International Road Machinery Exposition held from July 20 to July 25 at Los Angeles.

The exposition was formally opened on July 20 with an address by Mayor John C. Porter of Los Angeles. Attending the gathering were representatives connected with the highway construction industry not only from the United States but from Mexico, a number of South American countries, Roumania, and U. S. S. R.

During the period of the convention joint meetings of the Associated General Contractors and the Western States County Officials Assn. were held. A model showing highway construction, culverts, and bridges was displayed by the United States Bureau of Public Roads. Another model of timely interest was that of the Hoover Dam.

Obtains Loan to Build Highway to Mexico City

Mexico has just recently secured a loan of $2,800,000 for its highway program. The first part of the loan will become available next June and the funds will be devoted entirely to the completion of the road leading from the United States border at Laredo to Mexico City.

This loan closely follows a suggested plan outlined by the American Road Builders' Assn. some time ago and should be the beginning of a large highway program in Mexico. Where conditions are similar this plan might be the basis of other loans to Central and South American countries.

Detroit Sand-Lime-Brick Plant Working Full Time

After operating for only two days a week for some time, the Sand Lime Products Co. of Detroit, manufacturer of sand-lime brick, has increased the working week to six days, due to the production of a new white building block. The block was produced after months of experimenting. It is made from a combination of pure silica sand and quicklime and is steam cured under high temperature and pressure.

Many factors have been combined to create a block of extremely high strength and low water absorption. It is non-shrinking, relatively light in weight, true to dimension and easy to lay.

Moves Gravel Plant to New Location on Creek

The R. H. Eastwood Sand & Gravel Co. of Grayville, Ill., is moving and rebuilding its plant on Bonpas Creek. The operations, as reconstructed, will be located on a site on the opposite side of the stream, near its convergence with the Wabash River.

New bins, to permit truck-loading of materials in any size or combination of sizes, are being erected.

Missouri Gravel Company Gets Highway Contracts

The Missouri Gravel Co. of Lagrange, Mo., is reöpening its plant on the Mississippi River south of that place. The company has just signed contracts to supply aggregates for highway construction near Meyer, Mo. The material will be shipped by barges.

To Erect Kaolin Drying, Crushing Plant in Texas

The Coen Company, Inc., Gonzales, Tex., is about to begin the erection of a drying and crushing plant to prepare kaolin for shipment. The new operation will handle fifty carloads of clay per month, according to present plans.

Claims U. S. Gypsum Trade Names Deceive

UNFAIR METHODS ARE CHARGED

Charging it with unfair business methods, the Federal Trade Commission has instituted proceedings against the United States Gypsum Co., Chicago, requiring the concern to show why it should not be ordered to refrain from using the words "Sheetrock Wall Board," "Sheetrock Tile Board" and "Rocklath" in designating "certain building materials, made or composed partly or wholly of gypsum" declared to be manufactured and sold by it. The commission also charges that use of the word "fireproof" in describing these products is deceiving.

The commission declares that the company's wall-boards "are not fireproof, and buildings and walls of buildings in which they are used are not by their use made fireproof." The complaint says further that the products "are not rock, as defined geologically, or rock within the meaning of the term, rock, as commonly or popularly understood by the public."

The trade-mark terms for the United States Gypsum Company wallboards are said by the commission to have "the capacity and tendency to mislead and deceive the public into the belief that wall-boards are rock and to exaggerate the "misleading and deceptive representations regarding the structural solidity and permanency" of the company's building materials "when subjected to fire in burning buildings." These representations are said by the commission to tend to "divert trade and otherwise injure competitors of the respondent." Use of the word "fireproof" in describing the wall-board products also is said in the complaint to give occupants of buildings in which "Sheetrock" and "Rocklath" are used a feeling that their personal property is safe from fire and the consequences of fire "in their use and occupation of said buildings and thus to divert trade and otherwise injure competitors of the respondent."

"Sheetrock Wall-board," as described by the trade commission, consists of sheets "varying from about ¼ in. to ½ in. in thickness, from 32 in. to 48 in. in width and from 6 ft. to 12 ft. in length." These sheets are composed of a core, varying from about ¼ to ½ in. in thickness, "lying between sheets of paper or fibrous composition constituting the outer surfaces." The core is made of "a mixture of a certain quantity of a fibrous, wood or non-rock substance, described as a retarder or retardant of water, and of a product known variously by different names or terms. At the mills where it is produced it is sometimes referred to as or called 'stucco.' To the trade the said product is known as 'plaster of Paris,' and commonly it is described or designated as 'calcined gypsum.' This manufactured product, calcined gypsum, is made by the respondent by a process of reduction, or other mill process, from gypsum, a mined product geologically defined as native rock."

The complaint says that the outer portion of "Sheetrock" is combustible and that, while the core is incombustible, when exposed to fire it " 'calcines,' deteriorates, cracks and crumbles and loses its structural form and value." Fire-retarding and fire-resisting qualities possessed by "Sheetrock" and "Rocklath" are mentioned in the complaint. In a laboratory experiment, "Sheetrock" was said to have provided a "substantial barrier to the passage of flame for approximately 10 min. when exposed to fire in freely-burning materials on the inside of buildings and that 4-in. wood-stud partitions, on which "Sheetrock" wall-boards are used on both sides, gives the same result for about 20 min." Large portions of the wall-board fell in from 20 to 32 min. after being exposed to fire, it was said, "permitting fire freely to enter the hollow spaces formed by the wood members of the test wall or partition." The tests are alleged to have so impaired the strength of the wall-board that it was broken and dislodged by five streams of water 10 min. after being exposed to fire.

Several alleged advertisements of "Sheetrock" are quoted in the complaint. It is charged that since 1920 the company has claimed in its advertisements that "Sheetrock" is enduring and fireproof. Part of one of the quoted advertisements reads: "The New Improved Sheetrock—The Fireproof Wall-Board."

Discover Rich Deposit of Sulphur in Mexico

Discovery has been made of a surface deposit of sulphur which covers an area of several square miles, situated adjacent to the Rio Grande River in Mexico, opposite Candelaria, Texas. The deposit rises above the surface to a height of 10 to 25 feet, while its depth has not yet been ascertained. It is almost 100 per cent. pure sulphur according to reports.

There are several surface deposits of sulphur scattered about in the upper border region of Texas, but none has been found to contain sufficient quantities of the product to make it of great commercial value. The largest of these deposits is in Culberson County. Some years ago machinery was installed to mine sulphur there and a railroad was built to the deposit from an intersection with the Pecos Valley division of the Atchison, Topeka & Santa Fe. The supply was quickly exhausted, however. The deposit in Mexico would have to be transported by motor trucks or a line of railroad constructed to it from some point on the Southern Pacific.

Stone breaker in West Nyack quarry.

Producer of Trap Rock Installs Stone Breaker

The West Nyack Trap Rock Co., Inc., of West Englewood, N. J., recently installed a stone breaker—a Koehring crane equipped with a 3-ton weight—for breaking up large rock fragments in the quarry after they have been brought down by a blast. A view of the machine is shown here.

The company has also replaced its old jaw crusher with a No. 49 Kennedy gyratory.

Demands Publication of Rates on Georgia Gravel

The Georgia Public Service Commission has petitioned the Interstate Commerce Commission to force the railroads of that state to publish "forthwith" intrastate rates on chert, clay, sand and gravel. The rates in question would be fixed from all recognized points of production to all recognized points of destination within the state of Georgia.

This action was taken by the state commission pursuant to a ruling handed down by the Supreme Court of the United States on June 1 last to the effect that the Interstate Commerce Commission has the power to supervise the rates on the intrastate traffic.

It is charged by the Georgia commission in the petition to the Federal body that the ruling of the high court has left the rate situation more or less uncertain since the railroads have adopted a system of intrastate tariff schedules that is not meeting with the approval of the parties most vitally concerned. Being powerless to act the commission has asked the Federal commission to take a hand.

Adds Crusher and Belt Conveyor at York Plant

The York Valley Lime & Stone Co. of York, Pa., which has not been operating for several months is again back on production schedule, according to M. D. Druck, superintendent. A new crusher and belt conveyor was installed before the plant was reopened.

Lower Freight Rates in Southwest Region

NEW SCALE EFFECTIVE OCT. 15

Predicated chiefly upon complaints made by state officials having large road-construction programs in hand, the Interstate Commerce Commission has revised freight rates on sand, gravel, crushed stone and chat moving interstate or intrastate between points in Missouri and Kansas and Oklahoma and Arkansas. These rates become effective October 15.

Not all the wishes of the state officials were acceded to, the commission explained, pointing out that to do so would be to effect very deep cuts in railroad earnings. The proposed scales affecting intrastate movements in Missouri alone, it was calculated, would have lessened the state's freight bill by $156,000.

After a very elaborate and voluminous report on producing and shipping conditions in the industries concerned, the I. C. C. report observes:

"There is no complaint here that the sand-and-gravel business, considered as an industry, is suffering from any depression."

A rate of 55 c. a ton was fixed on crushed stone, gravel and sand, straight or mixed, in car-loads moving from Missouri and Kansas points within 15 mi. on a direct line from the passenger station of the Kansas City Terminal Co. at Kansas City, Mo., to delivery points in the Missouri-Kansas switching district.

A single- and joint-rate system was established for shipments moving from the same points of origination to places in the two states mentioned above, but which are not in the switching district. In the single line-rate a sliding scale of fees has been determined, advancing from 50 c. a ton for distances up to 10 mi., to $3.50 a ton for destinations as far removed as 800 mi. On joint lines the minimum rate is 65 c. a ton for a zone not exceeding 10 mi. The charges increase as the distances grow greater, reaching a high fee of $2.50 at 500 mi.

For purposes of administering the new rates, the commission will consider carriers under common control and management to be one line. Carriers are held to the shortest routes over which continuous carriage may be had in the computation of distances.

Less productive sources of these materials—Kengle, Price, Gray, Shirk and Joe Station in Okla., which are sand districts, and Price, Gray, Weertz and Garnett, Okla., which figure in the crushed-stone market—were placed on the same schedule with reference to shipments into Kansas and Missouri.

The hardest fight in the rate readjustment came in the matter of silica-sand tariffs. The carriers maintained that a larger fee should be fixed by reason of a greater value in the product, which finds its market in the field of glass production, casting and in the manufacture of silicate of soda, which goes into the making of soap. The sand interests maintained that all sand and gravel contains a high percentage of silicate and that this content should not be an issue in fixing freight rates.

However, the carriers proved that certain types of silica sand must be carried in covered cars and the commission decreed that a concession in their favor be made when such is the case. In cases where the use to which the product is to be put makes it possible to ship in open-top cars the rates heretofore mentioned will apply. When conveyed in box-cars between points in Arkansas, Oklahoma, Texas and western Louisiana and from these states to the east bank of the Mississippi River crossings, the rates will follow a scale beginning at 64 c. a ton for a 10-mi. zone to $4.15 for distances up to 1,000 mi.

Portable conveyors at the Weisgerber gravel pit.

Portable Conveyors Aid in Production of Sand

An interesting application of portable conveyors in the production of sand and gravel is shown in the accompanying illustration, taken in the pit of Weisgerber & Sons at Rochelle Park, N. Y.

A Thew shovel, operating at the bank, handles the pit-run material to a hopper which feeds the first portable conveyor. This conveyor carries the material upward and discharges it to an inclined stationary screen. The sand passes the screen and is loaded by a second portable conveyor, set at right angles, to a waiting truck. The gravel, or "oversize" product of the screen, is carried by a third conveyor to a stock-pile.

The photograph was supplied through the courtesy of the Portable Machinery Co. of York, Pa., which manufactured the portable conveyors used in this operation.

Two New Georgia Plants Will Produce Lime-Rock

The Perry Limerock Co. is developing and will operate two limerock plants near Rose Hill, three miles from Perry, Ga., and one at Grovania. Headquarters will be in Perry, and J. W. Thompkins, Ocala, Fla., will be in charge.

Awarded Contracts for New California Bridge

Contracts for excavating and supplying sand and crushed stone for the new Rubidoux bridge at Riverside, Cal., have been awarded the Riverside Service Gravel Co. The company has moved its steam shovel to the site and excavation for the structure will begin shortly.

Cement from the Riverside Cement Co. plant at Crestmore, Cal., will be used on the project, a state job to cost more than $100,000.

California Gravel Plant Gets Big Highway Order

Remodeling of the Stony Creek Gravel Co. plant near Orland, Cal., is under way in preparation for handling a 1,500-car gravel contract, said to be one of the largest single contracts of its kind ever awarded in Northern California.

The company, beginning Aug. 20, will ship gravel for the construction of a new highway to be constructed between Maxwell and Williams, Cal.

Illinois Paving Bids to Be Opened on August 18

The state of Illinois is re-advertising for bids on approximately 100 miles of concrete paving. The new bids are to conform to the recent legislative demand that an 8 hr. day for labor be enforced with minimum-wage scales in effect as prescribed by law.

The bids are to be opened at Springfield, Ill., on August 18.

Ready-Mixed Concrete in Road Construction

SWIVEL-TYPE CONVEYOR URGED

Ready-mixed concrete, with a production last year of more than 7,000,000 cu. yd., is an established method, according to a report of the Central- and Truck-Mixed-Concrete Committee, R. Keith Compton, chairman, of the American Road Builders' Assn.

The report states that the most practical solution of the plant problem lies in the development of a swivel-type conveyor, which will place the product where it is needed on the grade. The development of such equipment will overcome the present difficulty encountered where mesh reinforcing is used, make possible the reshaping of the subgrade behind the hauling equipment, and eliminate the possibility of nonuniform density which may be caused by the concrete being dumped in a pile and pulled into place by hand labor.

The problem of water-control is not confined to ready-mixed-concrete production, but is present in any concreting operation. It seems to be the opinion that there is no advantage in weighing the water.

The use of bulk cement is an operation which is rapidly gaining favor in the concrete industry. It is an entirely satisfactory and economical measure, if the work to be handled lends itself readily to an operation of this kind. However, the use of bulk cement should be decided upon only after a careful investigation of the project to determine whether or not the lay-out is such that the use of bulk cement would be of advantage.

The conclusions were as follows:

1. Ready-mixed concrete, manufactured under proper supervision is acceptable for all types of concrete construction.

2. The ready-mixed-concrete plant should be equipped with weighing devices, meeting the specification of the American Road Builders' Assn. for weighing devices for concrete aggregates, and as used by various state highway departments.

3. For low-slump concrete the "non-agitating" type of truck is satisfactory as hauling equipment under proper supervision and gradation of aggregates.

4. Specially-designed water-tight bodies with rounded corners should be required when open-type dump bodies are used.

5. The so-called "agitator" type of body has proved satisfactory for hauling concrete of any slump under proper supervision and gradation of aggregates.

6. Satisfactory concrete can be secured by truck mixers provided proper supervision and gradation of aggregates is exercised.

7. The use of central mixing plants, the transportation of mixed concrete, and the use of truck mixers may be permitted provided there is no segregation of material when the concrete is deposited on the subgrade.

8. The concrete may be hauled not to exceed 1 hr. (although it seems probable that there is no real necessity for placing a limit on the time between mixing and placing), except by special permission of the engineer, and must reach the subgrade in such plastic and workable condition that the slump, on the job, is within the limits specified.

9. Any concrete which is not plastic and workable when it reaches the subgrade should be rejected.

10. It may be pointed out that there is generally a change of slump with the lapse of time after mixing. This should be taken into consideration in arriving at a suitable water-cement ratio applicable to each job. In this respect complete coöperation between the engineer and the operator is necessary.

11. The methods of transferring the product from the hauling unit and depositing it on the subgrade have been discussed, as well as the protection of subgrades requiring such protection.

12. Where no mesh reinforcing is used, it was suggested that light steel channels be used for truck runways. These channels should be in sections, preferably 5 ft. in length. Where reinforcing mesh is used, portable swivel-type conveyors, to take care of at least 20 ft. of subgrade, could be utilized.

13. The use of bulk cement frequently presents an economical and, from an engineering standpoint, thoroughly satisfactory operation. However, the decision in this matter should be reached after an investigation as to the adaptability of the project to be constructed to such a method.

14. Engineers, in permitting the use of ready-mixed concrete, should, at all times, satisfy themselves that the operator is sufficiently equipped, both from the standpoint of personnel and mechanical equipment, to produce and deliver a product of a quality which is acceptable and in sufficient quantity.

Texas Producers Merge; Form Servetex Company

The Servetex Materials Co. has been formed at New Braunfels, Tex., by a merger of the Dittlinger Lime Co., Landa Rock Products Co., New Braunfels Limestone Co. and Charles Chaneseldt Co., San Antonio.

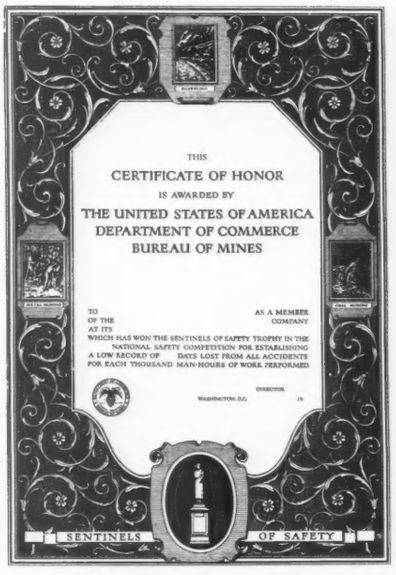
Officers of the new concern are: I. A. Ogden, Dittlinger Lime Co., president; Ernest Eikel, Dittlinger Lime Co., general manager; Max A. Altgelt, New Braunfels Limestone Co., secretary-treasurer; and C. Westbrook, Landa Rock Products Co., sales manager. Crushed stone and lime will be produced and marketed.

President Presents Safety Trophies

U. S. GYPSUM CO. A WINNER

Representatives of four prize-winning companies, entered in the 1930 National Safety Competition, gathered in Washington recently to receive from the hands of President Hoover the trophies won by their no-lost-time-accident records last year. The winners were the United States Gypsum Co., Gypsum, O., in the nonmetallic-mineral-mine group; Coxe Bros. & Co., Inc., Jeddo, Pa., in the anthracite-coal group; the Penn Light & Power Co., Coalmont, Pa., in the bituminous-coal group; the Penn Iron Mining Co., Vulcan, Mich., in the metal-mine group; and the Plymouth Mining Co., Wakefield, Mich., in the quarry and open-pit group.

The National Safety Competition, held annually under the auspices of



Facsimile of one of the certificates.

the U. S. Bureau of Mines, is a safety contest in which large numbers of mines and quarries, located in more than thirty states, participate. The contestants are divided into five groups, four of which comprise underground operations (anthracite mines, bituminous mines, metal mines and nonmetallic-mineral mines), while the fifth includes quarries or open-cut mines regardless of the nature of the mineral produced. The winning plants are the mines or quarries which, within their own groups, have the smallest loss of time from accidents to employees in proportion to the total number of man-hours worked.

At the close of each year a replica of the bronze statue, *The Sentinels of Safety*, the work of the well-known artist, Begnidel Piatta, is presented to the winner in each group. These safety trophies are donated by the *Explosives Engineer Magazine*.

Editorials

An Outsider Steps In

THE cement industry should consider itself fortunate in having arrived at two important decisions—the determination to employ an outsider as the directing head of its association and the choice of Edward J. Mehren for serving in that capacity. The first shows a realization of the truth that inbreeding, in business as in biology, tends toward deterioration of the stock through an increase in its weaknesses; the second displays a shrewd knowledge of men and an appreciation of demonstrated worth and fitness.

Staleness is the canker that eats through every organism which does not have its waning strength renewed by the substitution of growing for dying tissues, and it affects the trade organization exactly as it affects the physical organism. The lack of change in scene, constant association with the same problems and continued reliance on the same time-tried and time-condemned methods of attempting to solve them, and the resulting inability to conceive anything revolutionary in the way of possible remedies are the manifestations of intellectual inbreeding that prevents the development of maximum utility in those trade associations that entrust their direction to men within the industry. It is difficult for men accustomed to certain habits of thought to adopt an objective view of their problems, yet, until they do so, they have not arrived at that point of detachment necessary for a correct evaluation of either problems or remedies. The freshness of approach, so easy of attainment by an outsider, and the freedom from the shackles of custom and tradition, so difficult of attainment by the insider, are the qualities needed in business to-day. Most of our troubles are of our own making and, until we get a fresh perspective and an undistorted view, we are certain to see things as we have always seen them.

Mr. Mehren brings to his new work just that freshness, that detachment, which are so necessary to the accomplishment of maximum good for the cement industry. His experience as directing head of the editorial departments of numerous leading trade papers has enhanced the natural advantages arising from his position as an outsider, for it has accustomed him to thinking in large terms, to valuing trends rather than incidents, to viewing the objective and to searching for the most direct way of reaching it. In fact, there are few positions in modern business which can compare with that of the business-paper editor in its value for cultivating the untrammeled mind, the intellectual independence, which business seeks but so seldom finds.

We extend to the cement industry and to Mr. Mehren the highest form of good wishes when we say that we hope he will be given that liberty of action and freedom from carping criticism without which the qualities that he possesses can be of little avail. Mr. Mehren has a great task ahead of him and he brings to it exceptional talents and experience. These two facts indicate the necessity for giving full sweep to his ability if his great responsibility is to be discharged.

The New Sport of Business

ONE hears a great deal of high-sounding talk these days about the necessity for stabilizing prices, by which the ordinary man understands the maintenance of prices at the levels which prevailed before the present wave of price-cutting destroyed the profit motive of business. Every one is exhorted to sustain the former price structure, to avoid price-cutting practices by whatever fancy names they may be called, and so to assist in the rehabilitation of business. Which is very good advice in good times and is the acme of wisdom in times like these.

Yet price warfare continues, the heat of the battle even increases, while men blind themselves to the fact that business can not recover unless prices recover, that we can not expect to see the bottom of the business-depression curve until we reach the bottom of the price-depression curve. Men appear unwilling or unable to see that price-cutting is only slow destruction, that the disease of bad business is not to be cured by making a false diagnosis and then seeking to correct what seems to be the trouble. Price-cutting is a quack remedy, an opiate by which business men in pain may relieve the sufferings of the moment; but, while they weaken their sensibility to suffering, they also weaken their power to resist the ravages of the disease.

Those who expected that good sense would quickly replace the hysteria which has characterized nearly every man's action with regard to prices must certainly have been disillusioned by this time. Panic does not soon give way to sober judgment, especially when it becomes in effect a sport in which men strive to outdo one another in the commission of every kind of business folly. Good sense, wrongfully and too often named common sense, is not a common quality even in normal times; surely it is extremely rare and, indeed, almost absent in times of great mental stress. Those who believe that price-cutting is on the wane are too ready to make the wish father to the thought, for there is no conclusive evidence to show that the slashing of prices, in spite of the penalties it has inflicted, has succeeded in convincing many men of its absurdity and ineffectiveness. In fact, there is increasing evidence to show that the practice is becoming more common and the individual examples more flagrant in their violation, not only of good sense, but of the law of self-preservation. When producers are willing to "throw in" the sand if given an order for gravel, when they are willing to bid so low that a weighing of their transactions shows them owing the railroads money for freight on their shipments, when they are willing to ship their product 700

miles and undersell a price-cutting producer within 20 miles of the job—when these things happen, not once but repeatedly and in a seemingly inexhaustible variety of forms, we feel warranted in saying that price-cutting shows no signs of abating.

We have heard probably every kind of argument, specious and dishonest, offered in justification of price-cutting as it is now practiced. We have heard, possibly, every form of alibi, but no one has yet given us a good reason why the practice should be indulged in or why it should not have the inevitable consequences which every level-headed business man can easily foresee. It is understandable that some producers should wish to annihilate their rivals and that, confident of their own ability to outlast their competitors in the price-cutting race, they should be willing to underbid the lowest price asked on every competitive job. If this be the true explanation of our present price-cutting mania, then we suspect that very few concerns can remain in business, when all their efforts are directed at the extermination of one another and none at all are devoted to the satisfaction of reasonable market demands. On the other hand, it is conceivable that, while price warfare may not aim at the ultimate destruction of competitive enterprises, it may seek either to render them impotent for the time or so to hamper their future development as practically to insure their passing at last from the scene of conflict. If this supposition be correct, we can see only greater agony to come from drawing out a process which the business superman would say should be completed as quickly and with as little commercial bloodshed as possible.

Of course, in view of the anti-trust laws and our much-boasted reverence for the fetish of "free and unrestricted competition," no one has had the candor to acknowledge that he is motivated by any such predatory desire or to admit that his adoption of the practice of price-cutting has had any other aim than the preservation of his own business. Such an admission would be in extremely bad taste and would draw upon its maker an avalanche of troubles, legal and commercial, which no man, even in the disordered mental atmosphere of the present period, would knowingly invite. The expedient of attempting to delude competitors and the public by dressing price-cutting in fancy clothes has, we suspect, deluded no one as successfully as it has those who have adopted it. The buyer has certainly learned to recognize the advantages to him of relentless warfare between rival producers. Few buyers place an order these days until convinced that the seller has literally broken his back to win the sale. Competitive sellers have so completely forgotten the importance of profit—not necessarily large profit, but continuous, dependable profit—as an essential to permanence, that the buyer sits back as an amused spectator watching the sellers dash themselves to pieces on the rock of profitless prices. Time is not an important factor; he can well afford to wait. The longer he delays his decision to buy, the more heavily rages the conflict. Point by point falls the price, and one by one fall the rivals. As the rivals decrease in number, the rivalry increases in intensity, for each of those remaining in the conflict vows that he shall be the last to succumb. The longer they fight, the more they draw on their strength; and the weaker they become, the more the buyer stands to gain.

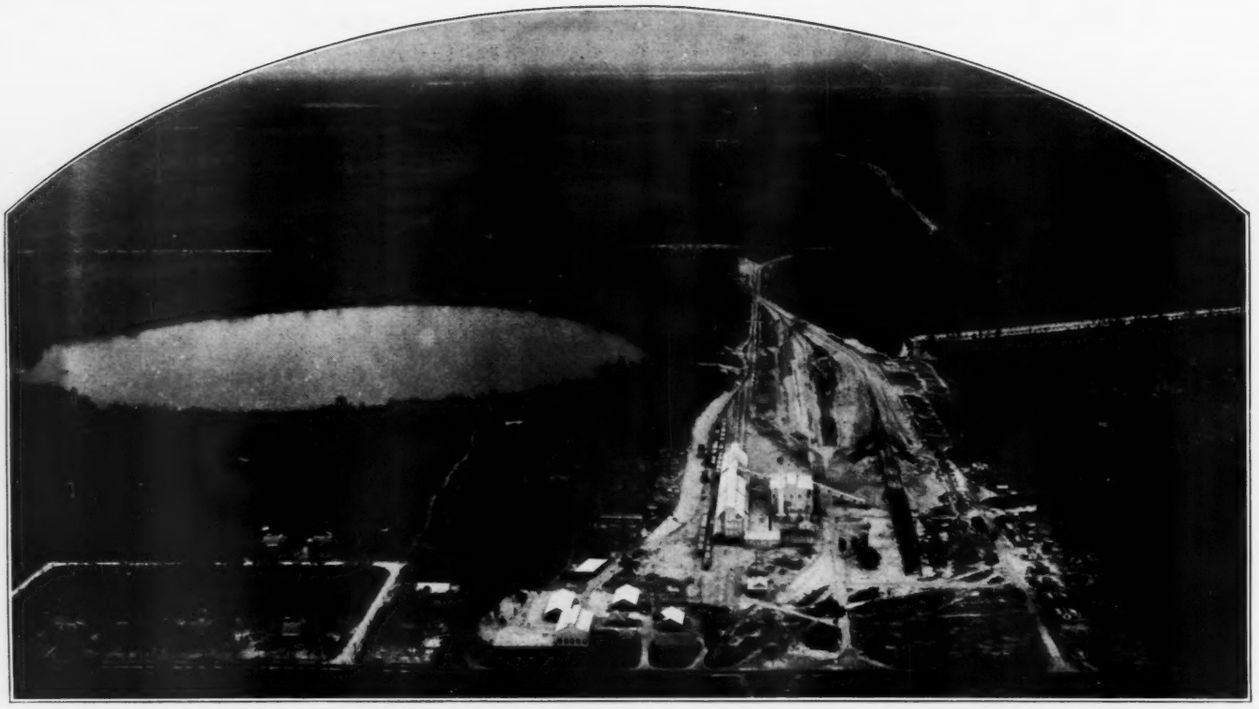
Price-cutting has become the great sport of business. It is the only sport, so far as we know, which exacts no charge for admission and in which the prize, instead of going to the winning contestant, is given to the spectator.

Hopes Are Becoming Defined

WHEN it comes to hopefulness, one business man in a state of business depression can display more faith in the future than a dozen optimists during normal times. The great trouble with his hope, however, lies in the fact that his future is too far away and, while he looks hopefully at the distant view, the present slips through his hands. If he could define his future and bring it within the range of undistorted vision, he would be better able to judge the present, for the near future becomes the present, even while we are watching it.

Hopefulness among purchasers is beginning to acquire definition, largely because a slight improvement in present demand is focusing their attention more on the immediate future and less on the distant and indistinct horizon. One can hardly experience an increase in business without feeling that the upturn has come. Sand-and-gravel and crushed-stone producers have benefited more largely from improved business than producers of other nonmetallic minerals and, for that reason, have greater expectations of future business. This is clearly evident from the reports of shippers to the regional advisory boards of the railroads. Their estimates of car requirements for the third quarter of the year show considerable gains in certain territories. In the southeastern territory this expected gain is placed at 12 per cent., in the southwestern territory at 15 per cent., and in the central western territory at 11.4 per cent., compared with the same quarter of last year. Cement manufacturers in the central western territory expect an increase of 10.7 per cent., while those in the Ohio Valley, southeast and southwest territories look for no change. In the northwest and Missouri-Kansas territories crushed-stone and sand-and-gravel producers expect this quarter's business to be equal to that of the same period of last year, and lime and plaster makers expect this quarter to be equal to last year's third quarter in the Ohio Valley, southeastern, southwestern, central western, and Pacific territories.

In thus giving definition to their hopes, producers are taking them out of the realm of hazy generalization and bringing them into the field of reality. It marks what we hope is the end of idle wishing and the beginning of reasonable expectation. The significant fact is that the improvement in business already experienced is the justification for these estimated expectations of immediate-future gains.



Aërial view of the new Ridgewood plant. Bonny Lake at the left.

Phosphate-Rock Producer Builds Modern Drying-and-Shipping Plant

New Plan of Raw Material Storage and Tunnel-Recovery System Also Installed

REPORTS of new developments in the nonmetallic-mineral industries continue to reveal the trend toward plant improvements directed at the achievement of higher efficiencies and correspondingly lower production costs. That this trend is due largely to dwindling profits caused by current economic conditions is unquestionably true. While a necessary expedient to meet present price levels, these improvements will become all the more profitable when normal business conditions return to those companies adopting them.

In the cement industry, for example, more and more manufacturers are turning to closed-circuit grinding, slurry filtration, and air separation as applied to raw and finish grinding in order to lower production costs. Reports of the increased efficiencies obtained are at times almost unbelievable, well illustrating the possibilities obtainable through improvements along these lines.

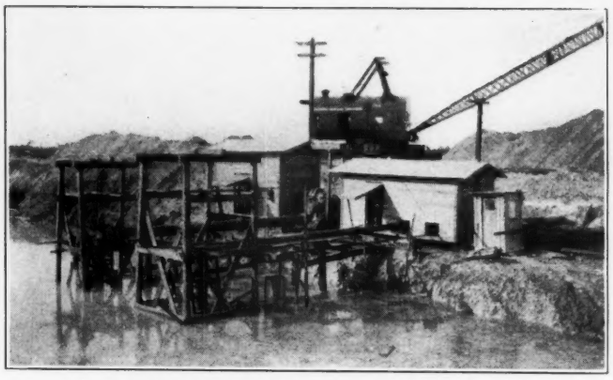
The goal at which the drive for higher efficiencies will eventually arrive is but a matter of conjecture; certainly no limits appear other than those fixed by a satisfactory return on the investment involved. In numerous instances, the drive for increased efficiency has resulted in the scrapping of old plants which are replaced by modern ones utilizing modern equipment embodying the latest engineering developments.

In the pebble-phosphate belt of Florida—an area which has long felt severe business reversals because of the decline of the fertilizer industry—no less than two of the largest phosphate-rock producers have replaced their drying and processing plants with more modern ones. One of them, the Southern Phosphate Co., Bartow, Fla., has in its new Ridgewood plant a fine example of what modern engineering is doing in this industry. Not only has this company replaced its drying-and-shipping plant but it has also erected one of the largest and finest raw-material storage systems to be found anywhere. The latter embraces a railroad-trestle type stock-pile underneath which is built an unusually fine example of a tunnel-conveyor recovery system.

The new Ridgewood plant is located between Mulberry and Bartow, Fla., in a most beautiful section of the state. The natural beauty of the wooded land which surrounds it is enhanced by a 60-acre fresh-water lake which is within the confines of the company's property and quite convenient to the employees who live near. A bathing beach, with the conveniences of a bath-house, has been provided for them and others who may care to visit Bonny Lake, as it is called, or the pleasant picnic ground near its shores. Even a miniature golf course has found its way to the Bonny Lake picnic

grounds. The lake is also the source of the plant's fresh-water supply.

To A. Benzon, chief engineer of the Davison Chemical Co., parent of the Southern Phosphate Co., belongs the credit for the new Ridgewood plant design. The work was carried on under the direction of C. A. Fulton, executive vice-president of the company in charge of phosphate operations, assisted by E. A. Pierce and C. N. Becker, local plant manager and superintendent respectively. The new plant is built of reinforced-concrete and steel throughout. Construction operations began in January, 1930, and were completed in August of the same year.

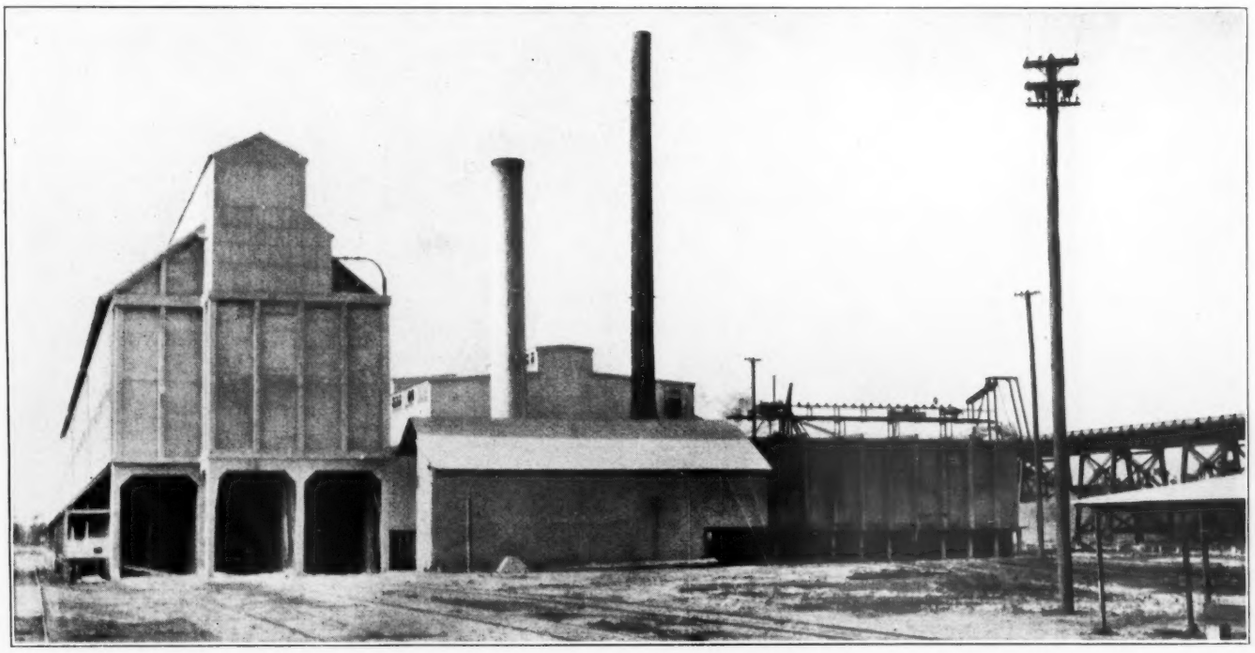


Pumping equipment at the Sangully mine.

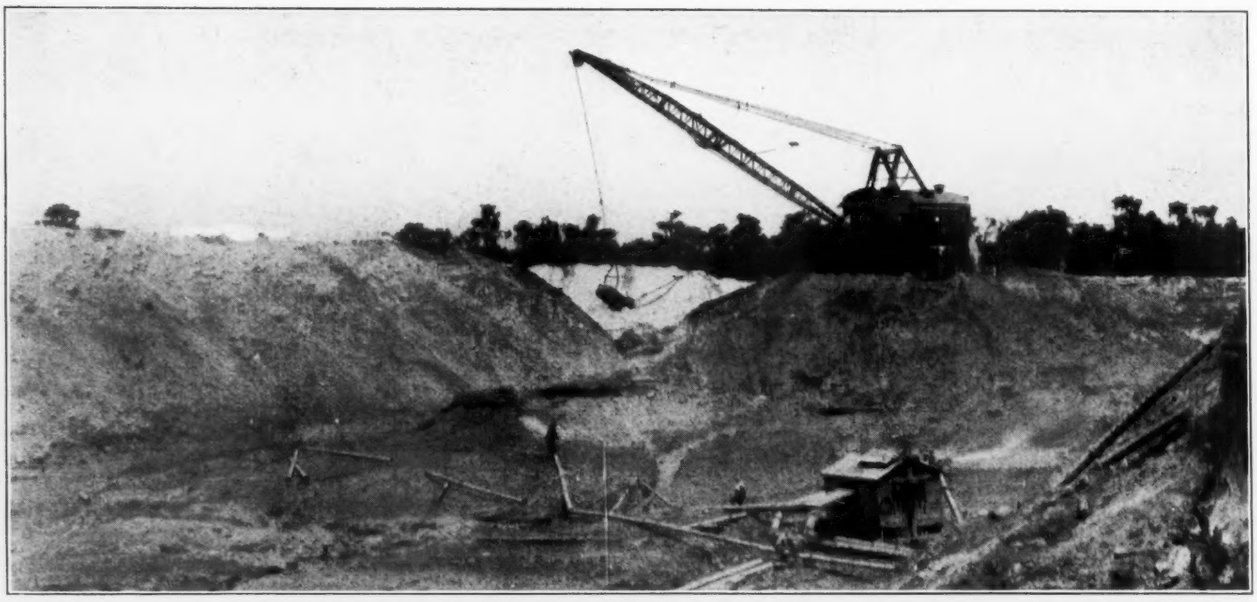
Before describing the new plant, it will be well to consider first the mining and washing operations, for they are of interest in themselves, especially the mining operation which combines the utility of both hydraulicking and drag-line excavation at their best.

The Southern Phosphate Co. owns two mines, the Sangully and the Paulway, each of which is located on a separate tract of land. Together with other holdings the mining property comprises 10,000 acres. The Sangully mine, being typical of this company's operations, will be described. As a rule, the pebble-phosphate deposits of Florida are open-pit mined, that is, they are stripped by drag-line excavation and the deposit is hydraulicked and pumped to washing plants. At the Sangully mine, the phosphate-rock deposit or matrix, as it is called, lies in a 10-ft. bed overlain with earth which varies from 15 to 20 ft. in depth. The deposit averages about 3,000 tons of phosphate rock to the acre. The matrix is mined in cuts usually 210 ft. wide extending to lengths limited only by property lines or other physical boundaries. A drag-line heads the operation and is placed approximately 35 ft. from the dump side of the cut. Thus, with the Bucyrus 8-cu. yd. drag-line, which has a 138-ft. boom, a cut of 210 ft. is easily handled, the overburden being dumped into the adjacent cut previously mined. Following close behind the stripping operation, the hydraulic guns wash down the matrix into a sump from which the phosphate sludge is pumped.

Picnic grounds and bath-house at Bonny Lake.



A view from one end of the Ridgewood plant.

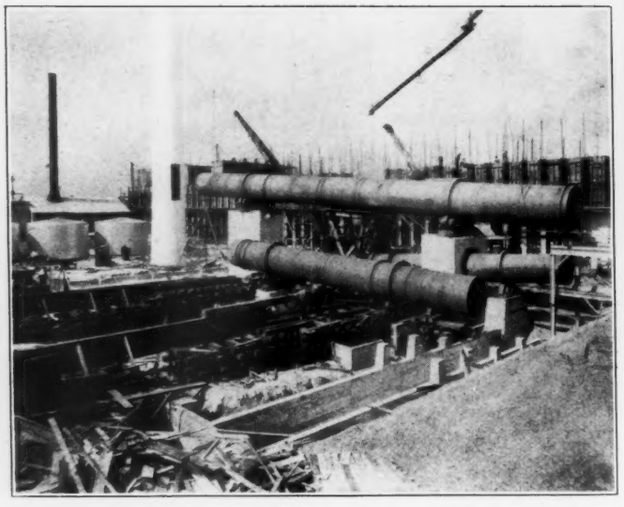


At the Sangully mine an 8-cu. yd. drag-line is employed. Hydraulic equipment in foreground.

An 8-cu. yd. drag-line is one of the largest machines of its type in use in the nonmetallic-mineral industry. There are, of course, even larger machines in use in coal- and iron-mining operations, but, nevertheless, an 8-cu. yd. unit presents a sizable mass of machinery. There are three of these machines in use in the Southern Phosphate mines, all electrically driven and equipped with their own motor-generator sets for direct-current control. Each machine is mounted on four double crawlers. When the ground is soft, as in marshy country, log mats are used. An idea of the enormous power of these machines can be obtained from the fact that they quite easily penetrate swamps and woods, tearing out trees and stumps with apparent ease.

In addition to stripping and overcasting the overburden, the drag-line also assists in the hydraulicking operation. Before moving the machine back for a new position after the overburden directly in front has been stripped, the operator cuts a channel in the matrix, along the side nearest to the machine, and dumps the phosphate rock on the top of matrix previously stripped. He thus narrows the width of the matrix to approximately 175 ft. and raises its height to 20 or 25 ft. This method allows easier recovery of the matrix, which bears considerable clay, and results in more economic hydraulicking through lessening the shifting of the gun positions. Ward-Leonard electric control on the drag-line allows one man to manoeuver the machine with ease. At the Sangully mine 600 cu.yd. of material is shipped per hour in normal operation.

Stock-pile tunnel and trestle under construction.

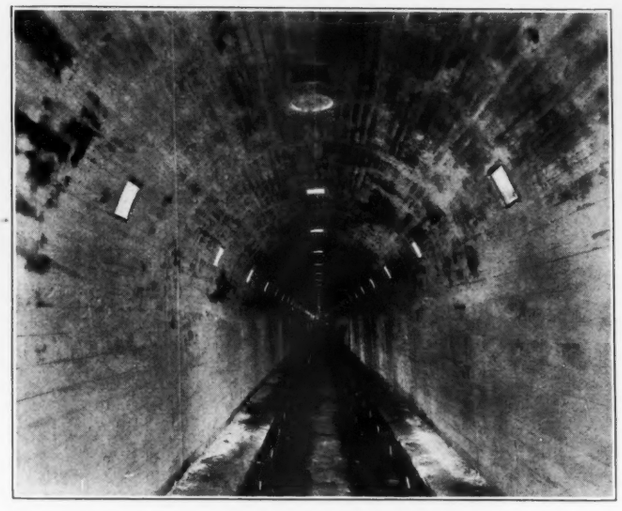


Construction view showing calcining kiln, cooler and rotary drier.

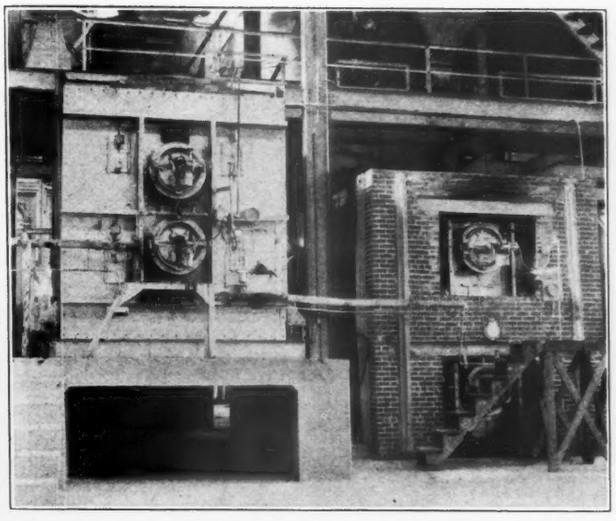
The two guns in use have 2-in. nozzle tips and are supplied with water at a pressure of 225 lb. per sq. in. in the pipe-line. Channels are cut from the deposit to a sump, from which a 12-in. special phosphate-rock pump delivers the sludge to a booster pump located midway to the washing plant. The pit pump is direct-driven by a General Electric

300-hp. motor and the whole unit is mounted on skids to enable easy shifting to new locations as the deposit is worked. The booster pump is also a 12-in. unit, but has a 200-hp. motor, and is mounted permanently. Both the hydraulic guns and phosphate-rock pumps were furnished by the Georgia Iron Works Co.

From the booster pump, the phosphate-rock sludge is sent directly to the washing plant, where it is received by a dewatering trough fitted with two panels of $\frac{3}{64}$-in.-mesh screen cloth. At this point the material is processed through succeeding steps, literally speaking, for the equipment is arranged in steps from the dewatering screen at the top to the final discharge to the loading-bin elevators at ground level. The entire process can be seen at a glance from a single position facing the steps of the washing plant, as illustrated by an accompanying photograph.

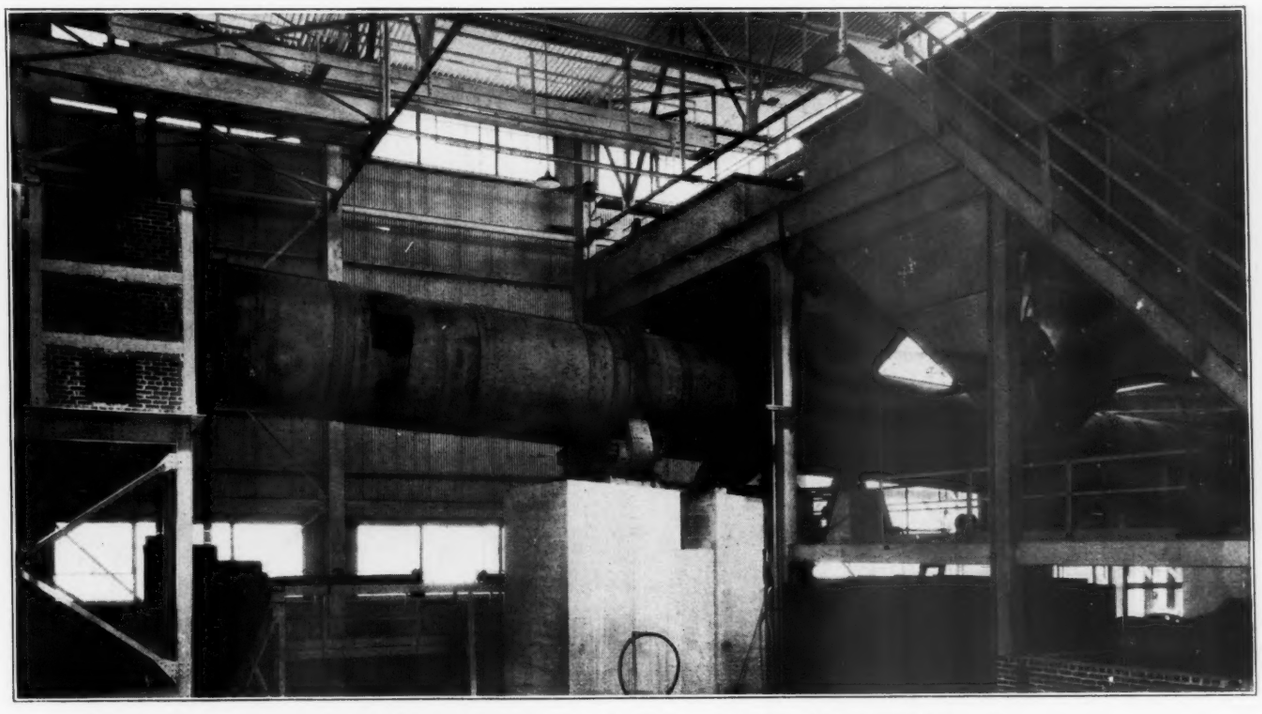


Inside the stock-pile tunnel. Note three rows of gate openings.

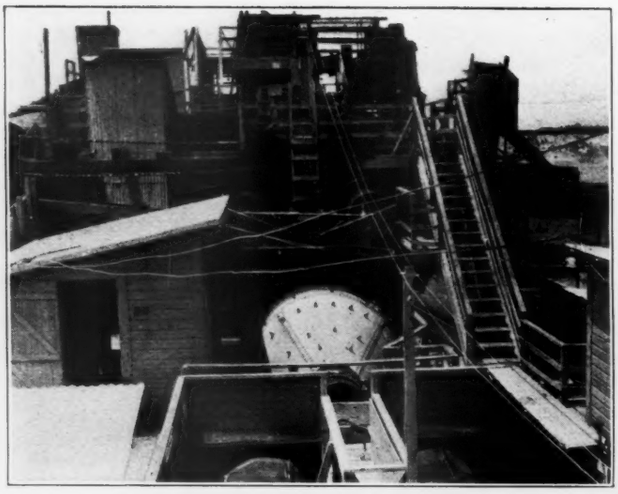


Oil burners supply heat to the driers.

The dewatered material, after passing over the screen, is sent directly into a 48-in. by 12-ft. revolving screen fitted with 2½-in. perforated plate. Exterior jets of water are directed against the screen and all oversize "rejects," which are largely clay balls, are sent to waste. The "through" material is divided and sent over two Link-Belt 4-ft. by 5-ft. vibrating screens equipped with 1-mm.-mesh wire-cloth panels. Here, again, the material is dewatered as it flows over the vibrators into the two log washers. The latter are Georgia Iron Works units, 21 ft. in length, which break up and dissolve the clay balls. The waste water from the log washers is flumed to a waste pond. All discharged phosphate rock from the washers passes



Interior of drying mill showing feeder tanks and the revolving calcining unit.



General view of the washing plant.

to two jacketed rotary screens for separation. The screen has 5/8-in. by 1-in. oval openings and the jacket 3-in. openings. Here the phosphate rock is divided roughly into two sizes, the larger size being sent either to one Hardinge conical mill or back to the log washers; while the smaller size rock is sent directly to another Hardinge mill. In both instances the Hardinge mills are used solely for their scrubbing action, no balls or rods being used as in grinding. The wash-water "throughs" from the rotary screen jackets are flumed to a sump for further phosphate-sand recovery.

From the Hardinge mills, the materials are again screened through two 12-ft. rotary screens, the "rejects" of which are returned to the log washers to reënter the circuit for further processing. The "throughs" then pass over another set of Link-Belt vibrating screens for dewatering and, thence, to the loading-bin elevators which send the material into bins for car-loading.

To prevent the loss of fine phosphate rock in the waste wash-water from the screens, the wash-water is collected from all the classifying and dewatering screens and flumed to a sump, where it is pumped to the top unit of a series of four screens, two rotary units and two stationary flat panels. All four screens have 1/32-in.-mesh wire cloth. The plus-1/32-in. material is then elevated to a car-loading bin. All the wash-water is again collected and pumped to a Farrenwald sizer, which floats out the fine phosphate sand and rejects fine silica sands.

The two washing plants ship the wet rock, via the Atlantic Coast Line Railway, to the new Ridgewood plant where three 1,200-ft. tracks are pro-

Dust-collector fans with driers below.

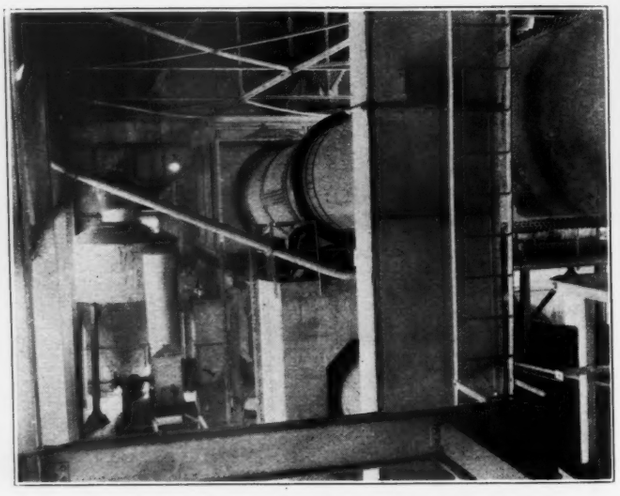
vided for handling the cars. From these tracks the cars are hauled to the trestle by a plant locomotive for unloading to the wet-rock stock-pile.

The wet-rock storage system of the Ridgewood plant is one of the most distinctive features of the Southern Phosphate improvements. In sheer size alone, the system is probably one of the largest in

Recovered phosphate sand being discharged to cars.

use in the industry, there being no less than 60,000 long tons of wet rock available for tunnel-conveyor recovery. The system consists of a 1,600-ft. double-track fill leading to an 800-ft. double-track steel trestle. The material stocked below the trestle is recovered by means of a tunnel-and-conveyor system and an auxiliary ground-track providing access for a locomotive-crane.

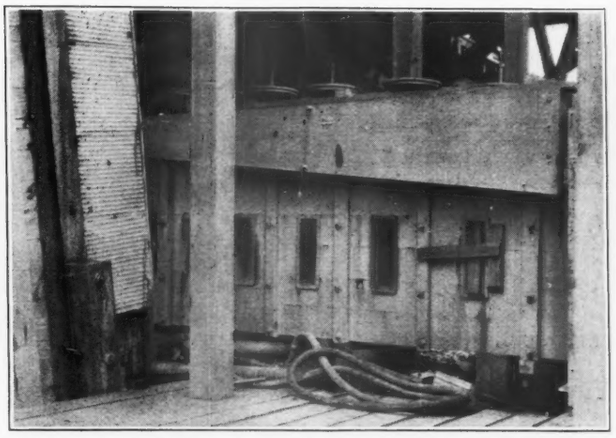
The trestle is supported by a number of fabri-



Fans draw the hot air from the coolers for use in the calcining unit.

cated-steel piers each of which is 20 ft. square. These piers are spaced 40 ft. apart and are heavily braced to withstand the internal pile pressure as well as the vibration caused by the cars being rammed to assist in unloading. The trestle tracks are 35 ft. above the ground level and are equipped with several switch turnouts to enable the locomotive to move from one track to another or to pass around a standing car.

Although the trestle is 800 ft. long, the present tunnel is but 440 ft. in length, which has been found sufficient to satisfy the normal storage requirements, although, when advisable, the remainder of the trestle's stock-piling capacity can be used. The material is recovered by means of an industrial Brownhoist 1½-cu. yd. locomotive-crane from a position on the trestle or from the ground track alongside.



Phosphate-sand-recovery sizer.

The wet-rock stock-pile trestle.

A view along the top of the trestle.

The tunnel has an arch roof integral with the walls and floor; it is 440 ft. long, 7 ft. wide and its height tapers from 10 ft. at the head end to 11 ft. 4 in. at the tail end. To accomplish the maximum storage reclamation, the tunnel was built in an excavated trench so that the arch roof does not project above the ground level. Instead of the usual single row of gates in the tunnel ceiling, three rows are provided so that, from a given position of the wagon conveyor-belt loader, material flows from the pile to the conveyor at three times the normal rate of flow from a single gate. As the phosphate rock is stock-piled according to its percentage of available bone-phosphate-of-lime content, ranging from 68 to 78 per cent., the material is sent to the plant according to its "b.p.l." quantity. Therefore, to maintain a flow of wet rock fairly consistent in its

analysis, the tunnel conveyor is loaded from one point only, which explains the reason for the use of three rows of bin gates to provide three times the rate of flow. There are 130 gates in the tunnel.

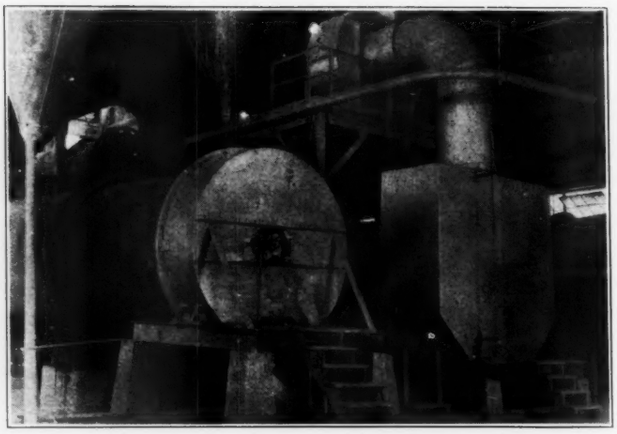
The tunnel conveyor (No. 1) is 435 ft. long between pulley centers and is equipped with a Goodyear 30-in. belt, which discharges directly to the plant inclined conveyor. The latter extends from a sump beneath the tail pulley of conveyor No. 1 and continues outward, at right angles to the tunnel, to meet a 20-deg. inclined steel conveyor-carriage which extends to the drying plant and thence overhead to the drier feed tanks. Both conveyors are designed to deliver 150 long tons per hr. No. 1 conveyor is powered by a 10-hp. motor through a Link-Belt reduction gear, No. 2 conveyor by a 25-hp. motor. All conveyors in the plant are equipped with Link-Belt idlers and return rolls.

The drying equipment of the Ridgewood plant consists of three units, two of which are rotary driers while the third is a rotary calcining unit. The last-named machine produces a phosphate product that is free from all organic matter and is suitable for use in baking powder and other chemical products. All three units are oil-fired and the manner of handling the raw and dried products for each is similar.

As stated, conveyor No. 2 delivers the wet rock from the tunnel to three feeder tanks in the drying plant. Each of these tanks or hoppers has a capacity of 150 long tons and is mounted directly above the head of the machine which it supplies. This places it, of course, near the roof trusses of the building. Conveyor No. 2 extends directly across the three tanks, and material from it is discharged to the desired one by means of a Link-Belt self-powered tripper. Two of the hoppers are equipped with table-feeders for supplying the two driers; the calcining unit is fed by a Schaffer poidometer through a conveyor and an elevator. The rock is fed to the hot ends of the driers and is discharged from the cool ends, while that for the calcining unit is fed to the cool end.

The first drier is a Ruggles-Coles unit, 7 ft. in diameter and 50 ft. in length, of single-shell construction. It rotates at the rate of 13 r.p.m., and

A view of the oil-storage tanks.



Hooded ends of driers and dust-collector fan above.

is driven by a 60-hp. motor through a Cleveland speed-reducer. The second drier is an Allis-Chalmers unit, 6 ft. in diameter and 60 ft. in length. It also is of single-shell construction and rotates at a speed of 13 r.p.m., being driven by a 60-hp. motor through an Allis-Chalmers Texrope drive. The two driers have a combined 24-hr. capacity of not less than 2,000 tons.

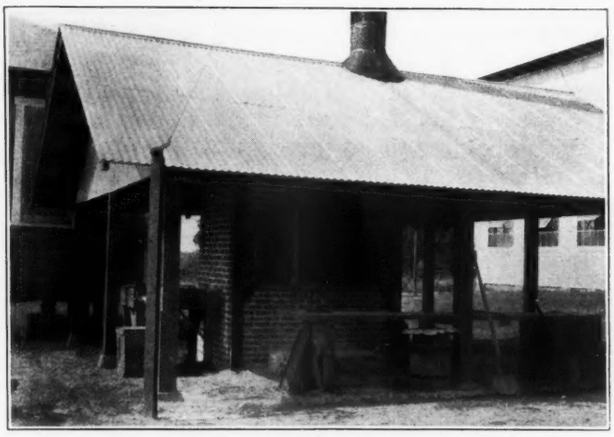
While not strictly calcining, according to the common interpretation of the word, the process employed in the drying procedure consists of drying the phosphate rock at temperatures high enough to drive off all organic matter. The calcining unit is also of Allis-Chalmers manufacture. It

Electric power-distribution panel.

is 6 ft. in diameter and 110 ft. in length, is mounted on two sets of trunnions, and is lined with fire brick. To accommodate a rotary cooler beneath it, the calcining unit is mounted high in the room, the head end being at least 30 ft. above the floor level. The calcining unit is operated at 1½ r.p.m. and is driven by a 30-hp. motor. Its discharge end is of concrete construction and serves also as the head end of the rotary cooler. The latter is 5 ft. in diameter and 50 ft. in length, and is similar to standard rotary coolers in construction. Use is made, however, of the heated air from the cooler in a manner that increases the efficiency of the unit. Air is drawn

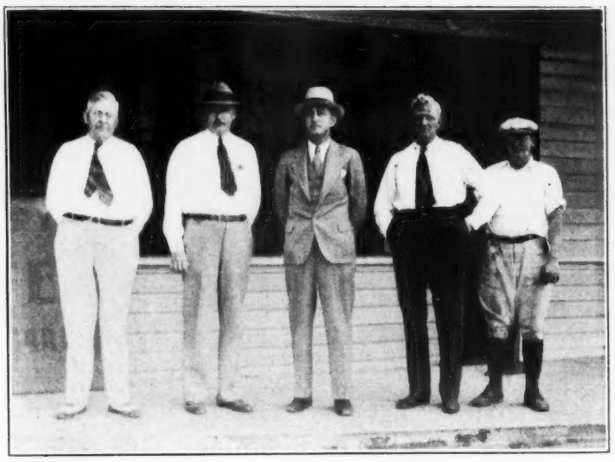
through the cooler by means of a Clarage induction fan and sent to the firing head of the calcining unit above. The temperature of the air entering the calcining unit is thus raised about 400 deg., resulting in fuel economy and, at the same time, an increase in the cooling capacity and efficiency of the cooler.

From the two driers, the phosphate rock is discharged to a hot-rock conveyor belt which sends it, through a series of conveying units, to the final loading bins. The two discharge ends of the driers are provided with hoods for dust removal. These hoods are piped to exhaust fans which withdraw the dust particles and send them into cyclone collectors mounted above. The precipitated dust in the collectors is then gathered by means of a Fuller Airveyor system and sent to bins in the car-loading building. Clarage fans—a No. 37 unit on the Allis-Chalmers drier and a No. 33 unit on the Ruggles-Coles drier—are used. In the event the Airveyor system should be out of service, the precipitated dust can be by-passed to the hot-rock conveyor.

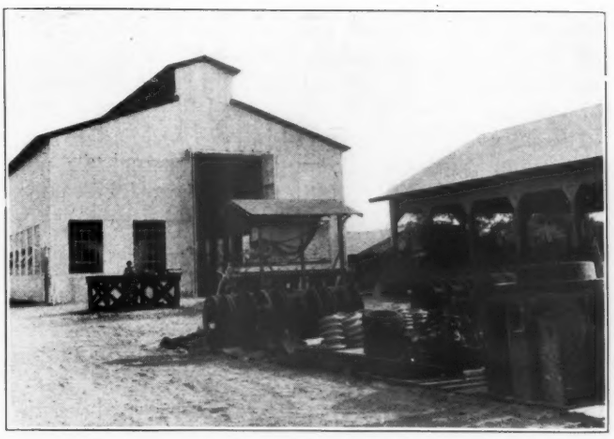


Oven for drying phosphate-sand samples.

The latter conveyor (No. 3) extends to a 20-deg. inclined-conveyor trestle and an elevator in the dry-storage building. This elevator (No. 1) is approximately 150 ft. long between centers and is equipped with a 24-in. woven-asbestos belt. It has a capacity of 150 long tons per hr. The calcined rock is handled, first, by a belt-bucket elevator in the drying plant and then by conveyor to the dry-storage building. The elevator, which is No. 2, is 55 ft. high between centers, has 8-in. by 5-in. by 7¾-in. buckets and a carrying capacity of 15 long tons per hr. Conveyor No. 4, which delivers the material from the elevator to the center dry-storage building shuttle conveyor, is 93 ft. long between pulley centers and employs a 14-in. woven-asbestos belt. It, too, has a capacity of 15 long tons per hr.



Left to right—E. A. Pierce, manager; C. A. Fuller, vice-pres.; C. N. Becker, supt.; Dan Carey, commissary head; and Ed. Purcell.



Supply house and yard. Machine shop at rear.

There are two Bethlehem Dahl oil-burners for each drier. A 14-10 gravity oil, or bunker C as it is called, is supplied to the burners from three 2,800-gal. storage tanks located adjacent to the drier building. The oil is purchased in tank-car quantities and is pumped to the storage tanks direct from the adjoining side-track. Before reaching the burners the oil is heated to a temperature of 270 deg. by three steam-tube heaters which are connected in series and are supplied by steam from a 60-hp. boiler. But two of the heaters are in use at one time.

Storage capacity for the dried materials is provided in the dry-storage or shipping building located near the drying plant. This building is in reality three buildings, these being placed end to end and having three car-loading tracks beneath them. It is 456 ft. long over all and 50 ft. wide; the approximate height to the conveyor penthouse roof is 80 ft. Within each unit of the building are four bins, each of which can serve cars on any of the three tracks beneath. While the rated capacity of each bin is 2,000 long tons, the total storage capacity is considered as 26,000 long tons.

The center unit of the shipping building stores only the calcined phosphate rock, which reaches it via belt conveyor No. 4 and is distributed to the four bins by means of a shuttle conveyor (No. 5). The latter is 88 ft. in length, equipped with a 14-in. hot-rock belt and is driven by a 5-hp. motor.

Dried phosphate rock is stored in and loaded from the two end units of the shipping building. It arrives by an elevator at a point between shipping units Nos. 2 and 3, and is distributed by two conveyors which extend in opposite directions across the tops of the units. Conveyor No. 6, which extends across the calcined-rock-storage unit to serve the dry-rock unit, is 286 ft. long between pul-

ley centers. Conveyor No. 7 is 153 ft. long. Both are equipped with 24-in. woven-asbestos belting traveling at 200 ft. per min. and carrying 150 long tons per hr. No. 6 is driven by a 10-hp. motor, and No. 7 by a 7½-hp. motor.

Shipments of the dried phosphate rock to distant inland points are made in standard box-cars. Materials sent to Tampa or other Florida ports for shipment by boat are handled to and from the ports in closed-top gondola cars, which are used in the Florida phosphate area only because of their local utility. All cars are loaded directly from the three tracks beneath the dry-storage building and trains are made up from the yard extensions of these tracks. The wet-rock storage ground-level track is connected with the dry-rock tracks by a loop to facilitate the handling of machinery or other unusual car movements.

The modernity of the mechanical end of the new Ridgewood plant is matched by that of equally modern electric-power distribution, motors and control apparatus. In the drying plant a central distribution board provides power for all the motors. Here the power is received from the substation and

The conical scrubbers at the washing plant.

is divided for the individual plant utilities, each line being adequately protected by circuit-breakers against overloads. An interlocking system of control has been devised so that the operation of every piece of machinery depends on that of the others. Should any one unit become overloaded, break down or otherwise fail, its motor is automatically released and the entire system, including the oil-burners, immediately stops. In starting or stopping, the units are individually controlled in the proper series. All motors are totally inclosed by dust-proof housings. All the electric equipment is of General Electric manufacture, and the actual erection of motors and equipment was made by the phosphate company's men.

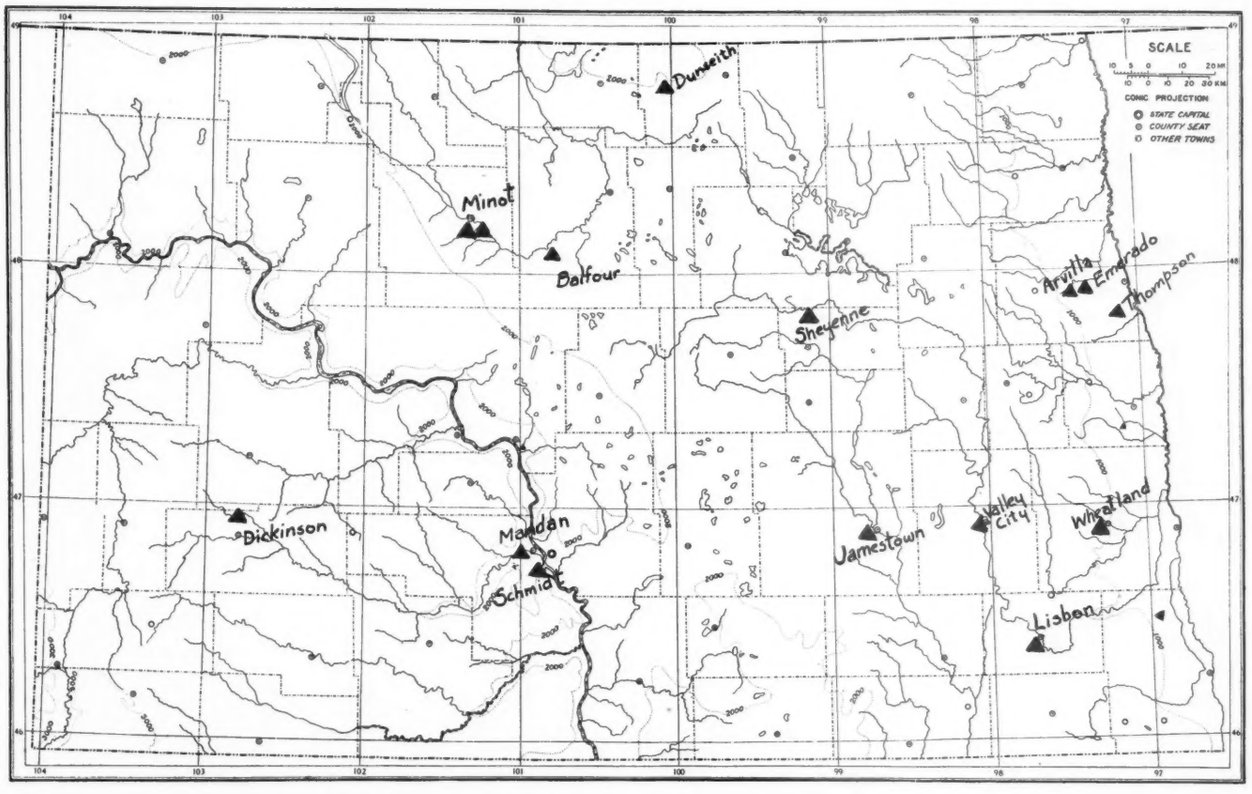
A well-equipped machine-shop, located near the drying plant, is served by an extension of one of the yard tracks. A 15-ton chain-operated bridge-crane facilitates the handling of heavy parts and in unloading or loading flat cars on the service track. Adjacent to it is a covered supply building for non-weatherproof materials and an open-storage space for weatherproof materials. Duplicates of the wearing parts of all machinery in the mines or in the plant are kept on hand. For example, there are parts sufficient to replace the entire hydraulic-pump equipment in the mines at one time.

In the vicinity of the shop is located the company's laboratory. This, too, is modern in every respect. Of special interest is its new outdoor brick sample-drying oven designed by Mr. Becker, plant superintendent. The actual conditions of drying in the huge driers are duplicated in this sample oven and are under thermostatic control. The oven is of brick-wall construction with a brick fire-box, in which is fitted a Ray oil-burner. The combustion flames are kept within the fire-box, only the gases coming into contact with the sample pans. The gases leave the oven, after passing through the sample chamber, by a draft created by the stack. By means of an electrically-operated thermostat, the temperature within the oven is maintained within a satisfactory range.

Feldspar Produced in 1930 Sold at Average of $6.21 per Ton

The crude feldspar sold or used by producers in the United States in 1930 amounted to about 171,788 long tons, valued at $1,066,636, or $6.21 a ton, as announced by the United States Bureau of Mines which has collected statistics in coöperation with the Geological Surveys of New York, North Carolina, South Dakota and Virginia. These figures show a decrease of 13 per cent. in quantity and 16 per cent. in total value in comparison with 1929. Feldspar was reported as having been mined and sold in 1930 in ten states—California, Colorado, Connecticut, Maine, New Hampshire, New York, North Carolina, Pennsylvania, South Dakota, and Virginia. The greatest feldspar-producing region is that which includes the Atlantic Seaboard states, from Maine to North Carolina. This region reported about 91 per cent. of the total output and value in 1930. North Carolina, the leading state, reported 60 per cent. of the total output; Maine, the second state, reported 13 per cent.; and New Hampshire, the third state, 10 per cent. The average value per long ton in North Carolina was $5.75; in Maine, $7.11; and in New Hampshire, $8.01.

Except for minor purposes, feldspar is prepared for use by grinding. This work is done principally by commercial mills; only a very small portion is ground by users in their own mills. In 1930 there were 34 commercial mills operated in 12 states, namely, California, Colorado, Illinois, Maine, New Hampshire, New Jersey, New York, North Carolina, Ohio, South Dakota, Tennessee, and Virginia. These mills reported 181,541 short tons of ground feldspar sold in 1930, valued at $2,450,915, or $13.50 a ton, compared with 230,582 tons, valued at $3,296,252, or $14.30 a ton, in 1929, a decrease of 21 per cent. in quantity and of 26 per cent. in total value.



Map of North Dakota showing location of some of the principal sand-and-gravel operations.

North Dakota Sand and Gravel Deposits Largely of Glacial Origin

By A. G. LEONARD

State Geologist, State Geological Survey
University of North Dakota

THE gravel and sand deposits of North Dakota are among the most important natural resources of the state. Good gravel is required for various kinds of construction work and many of the main highways are now being surfaced with gravel to give them a hard smooth surface throughout the year. For these purposes large quantities of material are required and in North Dakota gravel is practically the only material that is available. In most states is found rock which may be crushed and used for concrete and other construction work and for road surfacing, but, aside from the glacial boulders, there is almost no stone in the state which is suitable for these purposes. The shales and soft sandstones which underlie the entire region are not suitable for use as crushed stone since they are not sufficiently firm and hard. In a few places glacial boulders of granite and other kinds of rock have been gathered from the fields and crushed to furnish stone for construction purposes, as, for example, the paving at Devil's Lake, but for the most part gravel has necessarily been the only material used, together with a little clinker or scoria in southwestern North Dakota. Thus it will be seen that the gravel deposits are of the greatest value and importance, and it is fortunate that they are widely distributed and easily obtainable.

With few exceptions these gravels and sands are of glacial origin, that is, the rock comprising them has for the most part been brought into the state by the continental ice sheet which covered the greater portion of North Dakota during the Glacial Period. The stone which we are to-day using in our concrete and on our roads was brought by the glacier from Canada and scattered about where it would be of use. Had the ice sheets not thus transported the materials the rock used to-day would all have to be brought in from the outside by rail at no small expense. This is only one of many ways in which the continental ice sheets benefited North Dakota.

For purposes of description it is convenient to classify the gravel and sand deposits according to their mode of occurrence and origin as follows:

1. Gravels and sands of the glacial drift, commonly associated with terminal moraines:
   (a) In kames, eskers or other drift hills.
   (b) In outwash plains.

(c) In pockets of the drift.

2. Terrace gravels along stream valleys.

3. Gravels and sands of the beaches of extinct and existing lakes.

4. Residual gravels outside the glaciated area.

5. Gravels and sands of the White River formation.

It may be of interest to consider briefly each kind of deposit, with examples illustrating the different types of occurrence.

Drift Gravels

The gravels of the glacial drift are particularly likely to be associated with terminal moraines. Wherever the edge of the continental glacier remained more or less stationary for any considerable time during the retreat of the ice, the drift was heaped into an irregular belt of hills. Movement of the ice sheet brought the rock debris carried by it to the edge, where it was dumped off and accumulated to form the irregular hills and hollows so characteristic of terminal moraines. There is a series of these rough, hilly morainic belts in central and eastern North Dakota. The water flowing from the melting ice sorted more or less the materials of the drift, the finer clay particles were carried away, while the sand and gravel were often deposited in hills, ridges, or in irregular pockets in the boulder clay itself.

The best developed and most westerly of these terminal moraines is the Altamont moraine, which extends diagonally across the state from northwest to southeast through Divide, Burke, Mountrail, McLean, Sheridan, Burleigh, Logan and McIntosh Counties. Throughout much of its course it is not far from the eastern edge of the Missouri plateau and lies wholly upon this upland area. This moraine, which in places has a width of 20 mi., forms a very rough belt of irregular hills and ridges from 100 to 200 ft. high and with countless hollows among the hills, many of them containing water and forming lakes and marshes. Between the Altamont moraine and the Red River Valley there are many more or less continuous morainic belts having a general northwest-southeast course. One of the best developed of these lies just south of Devil's and Stump Lakes.

Gravels in Kames and Eskers.—Kames are hills or ridges composed of stratified gravel and sand, and they are commonly, though not necessarily, associated with terminal moraines. Many of the prominent hills of the latter are formed of gravel and sand rather than boulder clay and are therefore kames, and for this reason a favorable place to look for gravel deposits is in connection with moraines. These hills are formed near the margin of the ice sheet by running water, which, on issuing from beneath the ice, has dropped much of its debris, often in reëntrant angles and crevasses, and when the ice melts the gravel and sand will take the form of mounds, hills and short ridges.

Kame hills are common throughout much of the glaciated area of North Dakota and afford an important source of gravel. Many of the hills near Federal Highway No. 2, between Michigan and Rugby, are of this character and have furnished much of the gravel for surfacing this highway. Kames are common in Barnes and Stutsman Counties, and in the counties to the north and south of these. The gravel pit between one and two miles south of Minot is in a kame hill.

Eskers are ridges of gravel and sand which are believed to have been formed in tunnels in the bottoms of the ice sheets by the rivers flowing through them. These streams deposit the coarse materials along their course and, when the ice melts, these deposits form ridges 25 to 35 ft. or more in height. They are from a fraction of a mile to many miles in length. One of the best developed eskers in the state is that occurring near Balfour, in southwestern McHenry County. It has a length of 18 mi., and its course is nearly straight in a northwest-southeast direction. It is 25 to 35 ft. high, from 100 to 150 ft. wide at its base, and is followed by a road for 8 mi. Another esker is the gravel ridge about 6 mi. south of Harvey, and several others occur in eastern Barnes County, a few miles east and west of Oriska. There are no doubt others which have not yet been located and mapped.

Gravel in Outwash Plains.—When the margin of the ice is stationary and the debris is being heaped to form terminal moraines, the waters flowing from the melting ice transport large quantities of gravel and sand, much of which is carried beyond the moraine and spread out to form a gently sloping plain. The gravel and coarser material are deposited nearest the moraine, and the sand and finer sediment are carried farther before being dropped. Thus a moraine may be bordered by a belt of gravel of varying width and this outwash plain may contain large deposits. Such plains of outwash gravel are found associated with many of the moraines of the state, particularly with the Altamont moraine. They are well developed in northern Williams County, in McLean County about Turtle Lake and elsewhere, in Kidder County south of Tuttle, Robinson and Pettibone and east of Tappen, in Burleigh, Logan and McIntosh Counties and in many other areas. Outwash gravels are also abundant along the southern edge of the Turtle mountains between Rolla and Bottineau, and there is a large pit near Dunseith. Often these outwash gravels are concentrated and deposited along stream valleys to form valley trains which extend down the valleys for many miles. Deposits of this character are found along many of the streams, such as the James and Sheyenne valleys and are considered under terrace gravels.

Gravel Pockets of the Drift.—The glacial drift left by the ice sheet forms a mantle which, east and north of the Missouri River, almost entirely covers the bed rock to a depth of from a few feet to 100 or 200 ft. and over. This drift is composed largely of clay containing pebbles and boulders, the so-called boulder clay, which is well shown in road cuts in central and eastern North Dakota and in the northwestern part of the state. But while the drift is mostly clay it contains lenses and pockets of gravel and sand. These gravel pockets are very irregular in shape and vary greatly in size, ranging from a

few yards to many rods in diameter. They often contain masses of clay, good-sized boulders and patches of sand, so that it requires careful prospecting to determine the quantity of gravel they will afford and, commonly, there are so many large pebbles and boulders that the material should be screened before being placed on the roads. In many localities these pockets of gravel in the drift are the only source of material and, as a rule, no one deposit will furnish a very large supply. These pockets may occur in rather prominent drift hills or they may be found in the gently rolling drift plain, in which case the topography will afford no evidence of their presence and they are difficult to locate. These gravel pockets are widely distributed throughout the drift-covered area, where they are present in every county and are frequently an important source of this material.

Terrace Gravels

During the closing stages of the Glacial Period, when the ice sheet which had covered most of the state was melting and its margin retreating northward, the rivers were flooded and carried large quantities of debris from the ice. This gravel and sand were deposited along the streams to form valley trains which filled the valleys often to a great depth. Those of the James and Sheyenne Rivers were thus filled with such deposits to a depth of 100 ft. and over in the vicinity of Valley City and Jamestown. Later the streams lowered their channels in these valley trains, much of the sand and gravel was carried away, and that which was left in places along the valley sides forms the terraces of gravel and sand which are so common along most of the streams of the state. The extensive deposits at Valley City and Jamestown are in these terraces, and the same is true of those near Mandan, where the gravel occurs in the terraces of the Heart River and in those of the Missouri River several miles south of town. North of New Rockford there are large deposits of terrace gravels along the Sheyenne Valley in the vicinity of the town of Sheyenne. Three miles southeast of Minot occurs a broad gravel terrace along the Mouse River Valley and the Minneapolis, St. Paul & Sault Ste. Marie R. R. has here opened a large pit to secure material for ballast. Another pit has been opened half a mile nearer town, close to the base of the bluff, and a third large deposit is found in a terrace about 2 mi. west of Minot.

Often these terrace gravels of the valley trains occur along the smaller streams, if they were favorably located so as to receive the drainage from the melting ice sheet. As an example of such deposits along a small stream those in the valley of Boundary Creek, a tributary of the Mouse River in Bottineau County, may be cited.

Extinct Lakes Deposits

The waves of lakes sort the materials of the drift and form beaches which are in many instances composed largely of sand, but in other cases are formed of gravel. Lake beaches may thus become an important source of gravel, and in the Red River Valley these beaches are the only source of this material.

Lake Agassiz Beaches.—It is well known that during the Glacial Period a lake occupied the Red River Valley and the large basin to the north in Manitoba, now occupied by Lake Winnipeg and other lakes. This vast body of water, which during its greatest extension covered an area of over 100,000 sq. mi., larger than the combined area of the Great Lakes, was held in on the north and northeast by the continental glacier. This formed a dam or barrier which held the waters of the lake until the ice margin had melted back far enough to uncover the region of the north and allow the waters to drain into Hudson bay. During its existence the surface of Lake Agassiz was stationary for a considerable time at various levels and the waves thus built a series of beaches. The highest or outermost beach lies about 4 mi. west of Larimore, where, however, it has been largely removed by erosion, and 4.5 mi. west of Wheatland. Where well developed, these beach ridges have a width of 20 to 30 rods and rise 10 to 15 ft. above the surface on the east. These beach ridges are favorite sites for the buildings of the farm, many of which are located on these wave-built deposits of gravel and sand. They afford a sightly location several feet above the surrounding surface and with excellent drainage, so that wherever a road crosses one of these beaches there are generally a house and other farm buildings.

Not all these beaches are composed of gravel, for the waves built them of the material near at hand and often this was sand, while the same beach will be composed in some parts of sand, in others of gravel. But where the beaches are formed of the coarser material they constitute an important source of gravel and, as previously stated, they are the only source in the Red River Valley.

Three beaches west of Grand Forks supply large quantities of gravel. One of these, the Emerado Beach, extends just east of the town of the same name, and there is a large gravel pit in this deposit 2 mi. southeast of Emerado. The Great Northern R.R. has obtained many hundreds of train-loads of gravel for ballast from the Campbell Beach, which lies less than a mile east of Arvilla and extends also north of town. The variation in the composition of these lake beaches is well shown in the pit in this beach just northeast of Arvilla. Toward the south end of the excavation the deposit is almost pure sand with only a few pebbles, but less than 100 yd. to the north and northeast the material is mostly gravel. In places there is a layer of fine gravel 5 to 6 ft. thick with almost no sand, the pebbles being quite uniform in size and averaging less than ½ in. in diameter. Thus, within a short distance, this beach furnishes both sand and gravel.

Less than half a mile east of the Campbell Beach is the McCauleyville Beach, which is composed of gravel where it is crossed by Federal Highway No. 2 about one mile east of Arvilla, and a pit has been opened just south of the road.

The Emerado Beach is well developed about 5 mi. northwest of Thompson in Sec. 17 and 18, T. 150, R.

51, where, for a distance of about a mile, it forms a rather prominent beach ridge and is composed largely of gravel. While in some places there are interbedded layers of sand 4 to 5 in. thick, in other places the deposit is formed almost wholly of pebbles 1 in. or less in diameter, with little or no sand. As is often the case in these lake beaches, the coarse and fine materials have been so well sorted by the waves and currents, that only the coarser gravel is deposited at one point, while at another the finer sand was laid down in the more quiet waters.

In the vicinity of Reynolds and Buxton two other beach ridges, the Blanchard and Hillsboro beaches, have yielded great quantities of gravel, the Great Northern R. R. having opened large pits in these for ballast, one of them being about a mile west of Buxton. There is also an extensive deposit of gravel and sand in the Hillsboro Beach 3 mi. west of Kelso. where it is crossed by the North Branch of the Elm River. The deposit here is at least 10 to 12 ft. thick.

West of Fargo the only beach which contains much gravel is the highest or Hermon Beach, which is 4.5 mi. west of Wheatland. Both the Great Northern and Northern Pacific Railroads have opened very extensive gravel pits in his beach, and, where it is crossed by Federal Highway No. 10, it was found to contain large quantities of material suitable for road surfacing.

Those mentioned above are only a few of the many places in the Red River Valley where gravel and sand deposits are found in the beach ridges of old Lake Agassiz. But deposits of this character are not confined to the beaches of extinct lakes, since some of the present lakes of the state have gravel beaches capable of supplying much material. This is particularly true of Devil's Lake, which has several old beaches, the highest being about 40 ft. above the present surface of the lake. One of the lower beaches contains layers of fine gravel, though composed largely of sand, and the surfacing material for the road between the lake and town has come largely from this beach near the entrance to Chautauqua Park. Near where the Fort Totten Road crosses the Narrows there are two well-developed beaches, and both are formed largely of rather coarse gravel. The Casselton-Devil's Lake branch of the Great Northern R. R. had a large pit in the lower of these beaches and removed great quantities of gravel for ballast, but some is still left and is being used for building purposes. A pit has also been opened in the highest beach, just inside the Military Reservation fence.

Not only is gravel found in the beaches of this and other lakes, but the waves and currents have built bars and spits at the entrance of bays and, when these are composed of coarse materials rather than sand, they furnish a source of gravel. There are a number of such gravel bars and spits about Devil's Lake.

Residual Gravels

Residual gravels outside the glaciated area are confined to the southwestern counties. The continental glacier did not extend more than 40 or 50 mi. west and south of the Missouri River, so that the country beyond the limits of the ice was not covered with a mantle of drift with its associated gravel deposits. The following counties lie in this unglaciated portion of the state: Stark, Hettinger, Bowman, Slope, Billings, and Golden Valley. The only gravels occurring in this region are those composed of the harder and more resistant materials of the bed rock. The latter has suffered extensive and long-continued erosion, which has swept away hundreds of feet of strata. The greater portion of the clays, shales and sandstone has been carried away by the streams, but certain resistant and harder layers of rock which were present in these formations, withstood, more successfully the wear and tear of erosion and transportation and some of these materials have formed deposits of residual gravel. The more or less waterworn rock fragments composing these deposits are formed of local materials derived from the bed rock of the region, such as petrified wood, scoria or clinker formed by the burning of the clays above the lignite beds, and fragments of siliceous rocks. The gravels of this character are often deposited along stream valleys, where they may form terraces, but they are by no means confined to such localities and may occur in ridges and upland areas far from streams. As an example of the latter occurrence may be cited a deposit about 7 mi. south of Rhame, in western Bowman County, where the gravel is found on the top of a ridge. While these residual gravels are present along many of the streams in the southwestern portion of the state, one of the most extensive deposits known in the region is that which forms a low ridge in the valley of the Green River, 6 mi. north of Dickinson. The ridge extends along the north side of the valley for a distance of over a mile, and in the largest pit the gravel and sand have a thickness of 25 to 30 ft. Gravel suitable for concrete is obtained here, as well as good building sand.

Gravels of White River Formation

Still another source of gravels in Stark and Slope Counties is found in the White River formation, which formerly covered large areas west of the Missouri River but has been for the most part swept away by erosion, leaving only scattered remnants of a once widespread formation. Some of the residual gravels mentioned above contain a large proportion of pebbles from this deposit. The largest areas of White River formation are those composing White Butte (or Chalk Butte) in Slope County and the so-called Little Badlands of southwestern Stark County. The lower 50 to 75 ft. of the formation in both these localities is composed of a rather soft sandstone containing numerous well rounded water-worn pebbles. These pebbles are washed down the slopes by every rain and collect at the base of the bluffs and buttes. Mixed with the sand of these beds they would make a good material for road surfacing.

Origin of the Gravels

Most of the gravels of North Dakota are of glacial origin and were brought into the state by the conti-

nental glacier. The ice sheet which moved down from the north had its origin in the region west of Hudson Bay and, as it spread out gradually in all directions from this center, it gathered the loose rock debris from the surface, broke fragments from the exposed ledges and in other ways gathered its load. The rocks of the Lake Winnipeg region are largely granites and limestones along with other varieties, and these, with the addition of quartz, form the pebbles together with more or less local material, such as shale, which has not been moved far from its source.

But while the gravels were brought into the state by the ice sheets, the various deposits as we find them to-day were formed through the agency of water. The streams produced by the melting ice and the waves of the lakes sorted the coarse and fine materials of the drift and, thus, in many places separated the clay from the gravel and sand, depositing the latter in the hills, ridges, outwash plains, stream terraces and other accumulations mentioned above. That the gravels have been carried far by the streams and waves is shown by the fact that the pebbles are so well water-worn and rounded, as they would not be to any large extent in a journey in the ice.

Another evidence of the sorting action of water is found in the stratification of the deposits, by which the sand occurs in certain layers or lenses and the gravel in others. Thus, the coarse and fine materials commonly occur in alternating beds.

Surfacing and Concrete Requirements

For road surfacing a wide range of materials is used, varying from the finer grades composed largely of sand and small pebbles to coarse gravel formed largely of good-sized pebbles with comparatively little sand. To secure the best results the gravel should contain considerable sand, so that the materials will pack well, and it should not have a very large proportion of pebbles over 1 in. or 1½ in. in diameter, say not more than 5 to 10 per cent. If there are many of these large pebbles, they do not work down into the clay of the grade but project above the surface and make a rough road. Gravel containing much of this coarse material should be screened to remove the large pebbles.

Gravel suitable for concrete is not common in North Dakota. Many of the deposits contain fragments of shale from the bed rock and these render the material unfit for concrete. These shale pebbles absorb the moisture, swell up, and crack the concrete. Shale fragments are found in abundance in some of the gravels and, in places, form a large proportion of the pebbles, while at least a few of them are present in most deposits. Before a gravel is used for concrete it should be carefully tested to determine if it is suitable for this purpose. Among the gravels which have been used for concrete and have been found to be satisfactory are those from the large pit at Dunseith, the deposit between 1 and 2 mi. south of Minot in the hill just west of the road, and the thick deposit 6 mi. north of Dickinson.

Concrete-Paving Practice in Twenty Large Cities Studied

The cylinder-crushing strength which is required for the concrete used in pavement bases in cities varies from 1,000 lb. per sq. in. to 4,000 lb. per sq. in. at 28 days, according to Charles E. Reppert, city engineer of Pittsburgh, in a recent survey of paving practices in twenty large cities in the United States made by the American Road Builders' Assn.

Slightly more than one-third of the cities require that the concrete shall show a crushing strength of not less than some figure between 2,000 and 3,000 lb. per sq. in., says Mr. Reppert. Four cities permit the strength to be less than 2,000 lb. per sq. in., while many have no strength requirements to be met.

One of the requirements of the concrete used in bases, where the temperature of the base gets well below the freezing-point of water, is that it shall be so dense that the water in the pores will not freeze and disrupt the materials forming the concrete. Concrete having a crushing strength of between 2,000 and 3,000 lb. per sq. in. evidently satisfies this condition, as the cities having the colder weather require the concrete to be within this range, while the lower strengths of the concrete are used in those cities having a warm climate.

The maximum economy in the building of a concrete foundation can be secured only through the accurate proportioning of the aggregates, cement and water. Only two of the survey cities do not definitely require the accurate proportioning of the materials.

Only seven of the survey cities do not require that the concrete-mixer be equipped with a timing device. These cities may have exceptionally dependable contractors so that mechanical devices are not necessary to insure that the concrete is always thoroughly mixed. Timing devices, however, seem to be considered more certain.

A mixing time of from 1 to 1½ min. is the most generally used. No city reported the requirement of less than 1 min. Only three cities require over 1½ min. The longer mixing time makes the concrete more workable and allows the use of less water to produce cement that can be easily placed and without the separation of the water. It has been found that a long mixing time is an advantage in the preparing of central-mixed concrete, as it makes the concrete less likely to separate during its transporting.

The consistency of the base concrete when it is placed is considerably stiffer than that used for concrete-building work. The required slump of a standard cone, in almost every case, comes between 1 and 3 in. Well-proportioned and thoroughly-mixed concrete, having almost no slump, can be easily placed in a concrete base with a little light tamping.

The surveyed cities seem to be about equally divided on the question of using, for pavement bases, a concrete which runs into place and one that requires some tamping to place it properly.

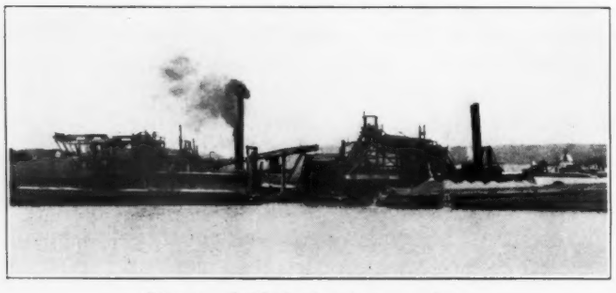
The dock showing the revolving crane-gantry installation.

Flexible Dock Facilities Eliminate Much Rehandling of Sand and Gravel

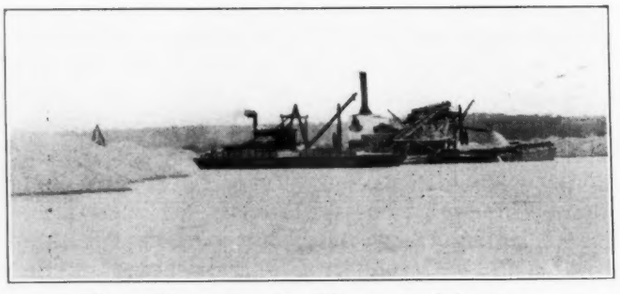
Revolving Crane on Gantry Unloads Barges to Cars, Trucks, Batch Hoppers or Storage

REHANDLING of materials has been one of the subjects for attack in the drive for greater operating economy in practically every branch of industry. In the problem of unloading river barges, not many plants have a system which combines rapidity of unloading as well as flexibility in disposal of the materials. During the past year, a number of new barge-unloading docks with new river plants have been built, some of which have achieved this ideal and are now showing unusual economy records.

In the southeast, the Richmond Sand & Gravel Co.'s new James River dock and city delivery offer some new thought on this problem. With materials-handling facilities conceded to be unexcelled anywhere on the rivers for its class of service, this dock-and-yard equipment sets a new mark for efficiency and economy of operation. One mechanical unit—a Dravo revolving crane mounted on gantry legs—handles the entire unloading operation, discharging directly to cars on tracks between the gantry legs, or to stock-piles alongside the tracks. It may also discharge directly into trunk bodies or into several weighing-batcher hoppers.



The two-hull dredge in operation.



Re-crushing plant, derrick-scow, and barges.

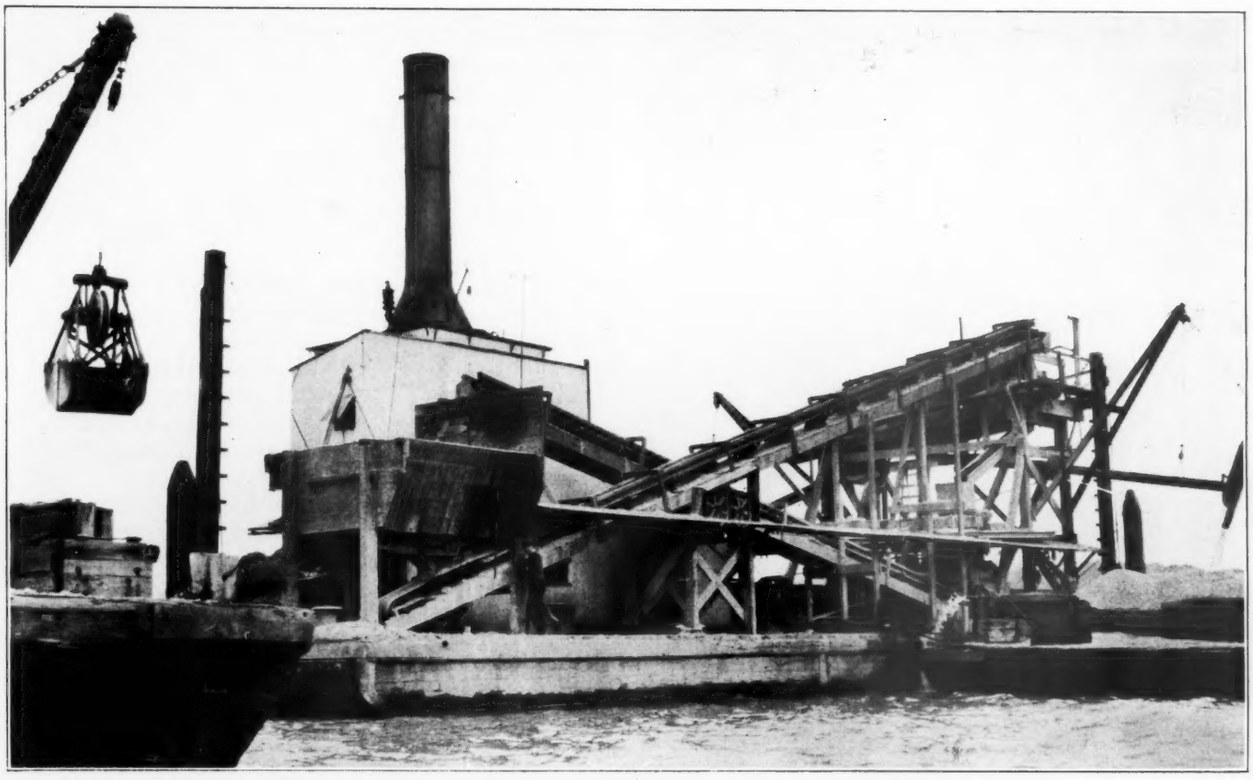
The Richmond dock, which was rebuilt and re-equipped by the Richmond Sand & Gravel Co., is one of five operated by the firm. Other docks are situated at City Point, Hampton, Newport News, and Norfolk, Va.—all located on waterways and all utilizing barges as the means of transporting aggregates from the dredging plants to the yards. The Richmond dock is located near the edge of the downtown business district and fronts the James River which is navigable to Chesapeake Bay. It measures 364 ft. in length, and the gantry track is approximately 15 ft. above the river level. A continuous row of piles was driven along the river front as a protection against the washing effect of the river as well as for a foundation to support the edge of the dock facing the river.

Immediately back of the piling, the site was filled in and the entire yard area made level with the adjoining street. Directly in front of the dock, the river bottom was dredged sufficiently to allow unhampered travel by the barges and tow-boats.

Most important of the facilities is the double-track railroad which extends along the dock for its full length and the crane-gantry which spans the tracks. The crane is a Dravo C-14 unit with a 75-ft. boom equipped with a 1½-cu. yd. Owens clam-shell-type bucket. The gantry, upon which the crane is mounted, spans both railroad tracks and is movable, two of the four wheels of the gantry legs being electric-motor-driven. Sixteen railroad cars can be handled at one time on the two tracks and the crane has access to any of them through its movement along a full length of the dock. Since barges of classified and washed gravel or sand are tied up at the dock, these finished materials can be recovered by the crane without additional towing of the barges. Also, barges can be loaded from the yard stock-pile, although this is not often done.

For handling truck deliveries, two 300-ton circular hoppers with weighing-batchers are provided, and one 3-compartment rectangular hopper equipped with a weighing batcher for dry-batching concrete aggregates. The latter is a Blaw-Knox unit storing 450 tons—one grade of sand and two grades of gravel. It has a 2-cu. yd. weighing-batcher.

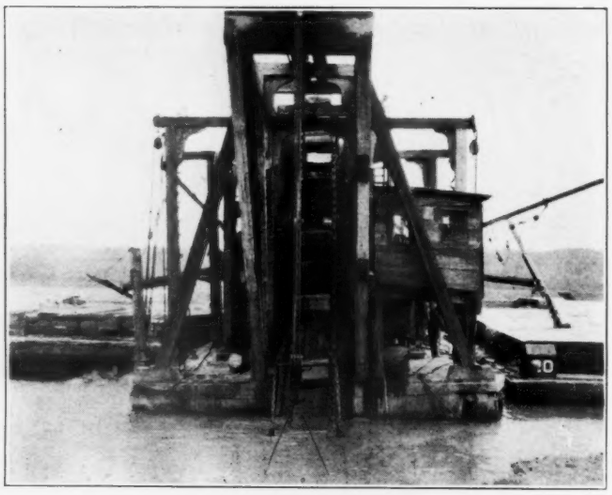
The three weighing-hoppers are placed in a straight line alongside the crane track and are separated by stock-piles of materials. Except for the hoppers, the stock-piles extend for the full length of the gantry track, providing storage capacity for 7,500 cu. yd. of material. Slag, stocked with the regular sand-and-gravel materials, is obtained from Sparrows Point, Md.



Close-up view of the re-crushing equipment afloat. Rotary screen and crusher at right.

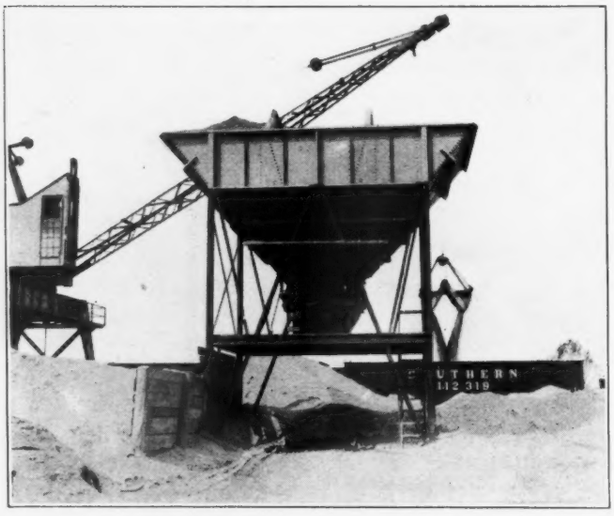
The company's dredging equipment is located on Farrar Island at Dutch Gap, on the James River, approximately half-way between Richmond and Petersburg, Va. Dutch Gap is of historical interest, and is one of Virginia's hallowed spots. Here the James River swerves from its general southeasterly direction and follows the course of a complete horseshoe curve, returning to a point within a few hundred yards of the start. Near the narrow strip of land, or isthmus, from point-to-point on the horseshoe, the colony of Henricopolis was established by Sir Thomas Dale about 1610. History tells us that during a feast in which peaceful Indians were the colony's guests, a dispute arose and the

entire colony was massacred. During the "War of the States," federal troops under Gen. Butler attempted to take Richmond via the water route as had been so successfully done at Vicksburg. To get to Richmond via water, it was necessary to navigate the horseshoe of the James near the spot of the Henricopolis colony. Confederate forces encamped on the bluffs surrounding the horseshoe made navi-



End view of the dredge showing ladder.

gation of this part of the stream impossible and, as a last resort, the Federals began the cutting of a canal across the isthmus. The work, which was aided by the rapidity of the river at this point, was unavailing, as the attack on Richmond was never carried out. Dutch Gap to-day bears the fruit of efforts of the Federal forces, for river traffic no longer uses the horseshoe as its passageway, the gap providing a time-saving cut-off.



Dry-batching hopper for aggregates.

Farrar Island, the land surrounded by the river horseshoe and Dutch Gap, is the location of the company's dredging activities. With 792 acres of gravel-bearing land, averaging 52 ft. in depth of deposit, the company owns a supply sufficient for fifty years. The overburden, a sandy loam, averages 5 ft. in thickness.

The stock-piles and tracks for car-loading.

Somewhat different from the usual type of ladder-dredge is the dredging equipment operated by the Richmond company. Instead of the usual single hull, this dredge is a merger of two hulls, placed end to end and hinged together. Each hull is 100 ft. in length, 32 ft. in width and 9 ft. in height from deck to bottom. At the front end of the fore hull, a notch is cut for the ladder. The fore hull carries the ladder, grizzly screen and sand screen, all operated by an engine for which steam is furnished by two Erie Iron Works 150-hp. boilers. The aft hull carries the revolving classifying screen and a No. 16 Champion crusher. This equipment is independently driven by steam engines supplied by two Ames Iron Works 150-hp. boilers.

A 45-ft. ladder having ¼-cu. yd. buckets is used. Material from the ladder buckets is dumped directly on a grizzly which rejects plus-8-in. stones. A 5-ft. by 20-ft. revolving screen with ¼-in.-mesh screen and a 1/16-in.-mesh screen jacket separates the sand from the gravel. Both sizes of sand are washed out to barges alongside by means of water-pressure jets. The gravel is then conveyed to the aft hull by a 24-in. belt conveyor which delivers it to a hopper. This, in turn, feeds a bucket elevator which delivers the gravel into a 6-ft. by 24-ft. revolving screen for washing and classification. Four classes of gravel are made by this screen, 2½-in., 1½-in., 7/16-in. and ¼-in "Rejects" from the screen are conveyed to the Champion crusher which is operated in closed-circuit with a revolving screen. The finished

(*Continued on page 42*)

The city-delivery facilities.

Sand-Lime-Brick Production as a Means of Utilizing Waste Material

By R. B. STUCKEY
Chief Engineer, Dry-Press Division, W. A. Riddell Co.

AS a rule, all by-product material will require a certain amount of hydrated lime, or cement, mixed thoroughly with the material, so as to set up a chemical action in the hardening cylinder between the lime, or cement, and the by-product used to harden it in a satisfactory manner for the making of sand-lime brick. In order to obtain the best results, it is necessary thoroughly to mix the lime, or cement, with the body of the material. The machinery used to mix the different kinds of material should not only have the ability to do this thoroughly, but should be able to knead, or grind, the different kinds of material together in order to obtain the best results. The wet-pan mixers, or the bar mill, are the two different types of machines that are in general use for this purpose.

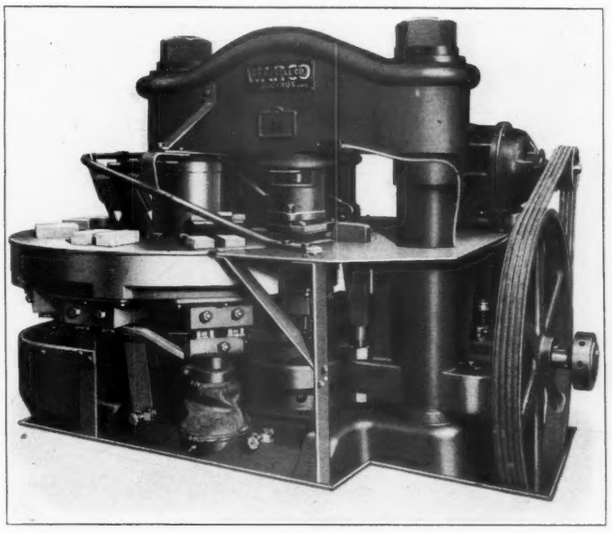
After the materials are thoroughly mixed together, they are ready to be pressed into the various shapes desired, which is usually done by using a rotary, or a vertical press. Such a press should have sufficient strength to withstand very heavy pressure. Different kinds of material will vary considerably as to the amount of pressure that will be required to form a good brick or block. Usually, the heavier and coarser the material, the greater the amount of pressure that will be required to obtain a good dense brick with well-formed sides and corners. While with the finer and lighter materials less pressure will be required, they are liable to show pressure cracks before they become dense enough to make good strong bricks. These pressure cracks occur while the bricks are being pressed in the molds, and are caused by the air trapped in the material. After the forming pressure is released, this trapped air expands and cracks the brick.

The best bricks that can be made of such material are made by applying the greatest amount of pressure that the material will stand without showing these cracks. Quite often bricks have pressure cracks on the inside and these do not show on the surface. Such bricks are inferior.

Any one contemplating the building of a new plant for making bricks out of his material should first have the material made up in full-size bricks, or whatever shapes he intends to manufacture, on a machine similar to the one he intends to use. In other words, if the tests are made on a hydraulic press, he will not get the same final results as if he makes his tests on a power-driven press. The difference is in the time during which the pressure is applied to the material in the molds.

With the hydraulic presses that are on the market at the present time, the pressure applied while forming the bricks remains on the material for a considerable length of time. This allows a much longer time in which the trapped air can escape from the material than is the case when the material is pressed into bricks on a power-driven press having a high capacity of bricks for a given amount of time. Generally, bricks tested in commercial laboratories are formed in a single-mold hydraulic press, making 2 or 3 bricks per min., while a power-driven press usually makes 30 to 50 bricks per min. pressing from 2 to 6 bricks at a time.

The Ohio State University experiment station at Roseville, O., has been experimenting on removing the air from the material in the molds, while the bricks are being pressed, using various kinds of clays. The results, made on a single-mold hydraulic press, have been very encouraging. The W. A. Riddell Co. is now experimenting with a 16-mold rotary press which has a large per-hour brick capacity. It has had very good results on removing the air from the material in the molds and expects to be able to furnish, within the very near future, presses of either the vertical or the rotary type with air-extracting equipment that will make good bricks of material that is subject to pressure cracking while being formed in the molds. In most cases, the rotary press is preferred to the vertical press for making brick or blocks out of various by-products.



A 16-mold sand-lime-brick press.

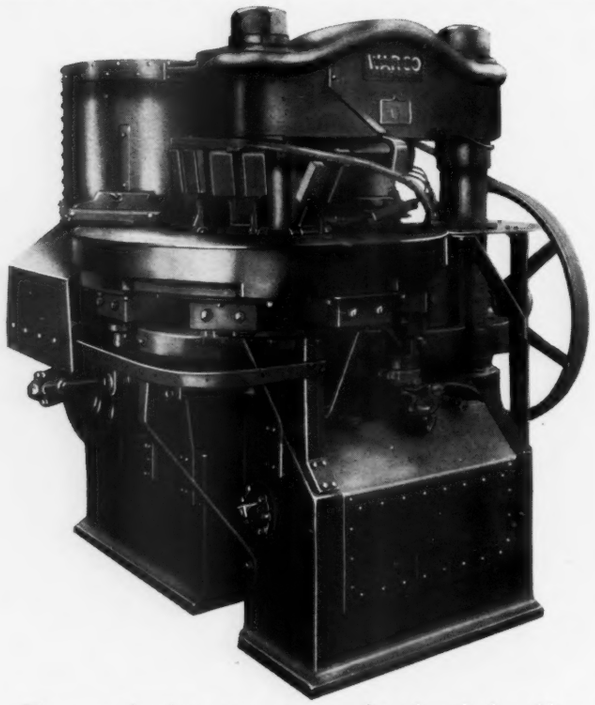
Bricks or blocks made from any silicate material, as a rule, will not stand as rough handling from the press before they are cured as bricks made from clay materials.

The principal difference in making bricks on the rotary and the vertical press, is in the delivery of the pressed bricks from the molds on the two type presses.

On the vertical press, after the bricks are formed

in the molds, they are ejected from the tops of the molds and pushed on the discharge table by the mold charger. If the bricks are pressed from tender material, the rear corners are likely to be damaged. With the rotary press, the bricks are ejected from the mold to the top of the table in a position so they can be removed without any sliding movement on the table. They are removed without injuring the edges or corners, and are placed on pallets or curing cars in perfect condition.

After the bricks are pressed, they are usually placed on a curing car. Such a car generally holds 1,000 to 1,250 bricks. After the car is loaded it is run into a steam cylinder, which is usually 72 or 78 ft. in diameter and from 40 to 80 ft. in length. After the cylinder is filled and the receiving-end head is closed, steam is turned into the cylinder



The press showing upper pressure plates in raised position.

slowly, until the pressure reaches the desired amount, usually 125 to 150 lb. This pressure is maintained from 6 to 8 hr. before the chemical action is completed. Then the steam is allowed to escape from the cylinder and the head is removed. The cars loaded with bricks are taken from the cylinder and are allowed a few hours in which to cool, after which the bricks are ready to be placed in the wall.

It is thus possible to make bricks one day and lay them in the wall the next day, saving the manufacturer the expense of carrying an enormous amount of stock. Whenever it is desired to carry several hundred thousand finished brick in stock, it is a good plan, if storage room is available, to have a sufficient number of hardening cars on which to carry the stock, as the expense of unloading the bricks from the cars and placing them in storage piles would pay the interest on the investment for a year, if each car were unloaded five or six times and the bricks placed in storage.

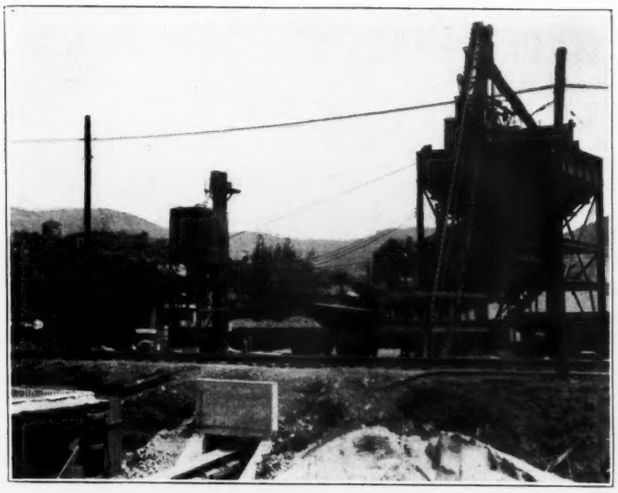
As to the cost of manufacturing the various by-products into bricks, this can be determined in most cases, after a careful analysis of the material that is to be used, the distance of the material from the manufacturing plant, the method of supplying the material to the plant, and the amount of lime or cement that is required to harden the brick properly. As a rule, 8 per cent. of hydrated lime is required properly to harden the brick when using a good grade of sharp sand. Some by-products will not require so much. There are some materials that contain enough natural lime to harden the brick without using any additional lime.

After the material is supplied to storage hoppers or bins at the manufacturing plant, five men will be required to man a one-press plant making 20,000 to 25,000 bricks per day. One man is required to tend the machines that mix the materials. Two men are required to take the bricks off the press and place them on the hardening cars. One extra man is usually required to relieve the men at the press and to deliver the empty cars to the press to be loaded. This extra man, together with the man who attends the mixer, places the loaded cars of pressed brick in the cylinder. In medium-sized plants, after the day's run is made, these same two men generally close the hardening cylinder head ready for the steam to be turned in. It is common practice, just before starting to make bricks at the beginning of the day, for all men to remove the loaded cars from the cylinder and place them on storage tracks ready to be loaded on trucks for delivery to the job. Besides the four men who actually operate the plant, assuming that all machinery is driven by electric motors, there will be a night man required to fire the boiler which furnishes the steam for the cylinder for hardening the brick. On an average, the boiler will use about 120 to 140 lb. of coal to harden 1,000 bricks. In most instances, five men are required to operate a one-press plant, taking the material from the storage hoppers, manufacturing the finished brick, and placing the loaded cars on storage tracks ready to be loaded on delivery trucks.

Dredges River Aggregates to Supply Mixed-Concrete Operation

A NEW sand-and-gravel operation designed especially to serve the requirements of transit-type mixer trucks was placed into service at Wheeling, W. Va. on Mar. 15, 1931. The new company is known as the Independent Sand Co., and is headed by H. L. Seabright, president of H. L. Seabright Co. well-known contracting and builders-supply firm of Wheeling.

The new plant is located at 35th and Market Sts. along the east bank of the Ohio River. Sand and gravel are obtained from the river by means of a ladder dredge which carries a complete screening plant on board. The dredge was reconditioned prior to its use by the Independent company. Four steel barges are operated to and from the dredge location, being towed by a Diesel-engine driven towboat, the *Return*. At the plant the barges are un-



The operations as seen from the river bank.

loaded by a derrick boat, the materials being sent via a conveyor-and-elevator system to a Heltzel 400-ton capacity steel bin. The bin is equipped with a

Equipment used for loading trucks from the stock-pile.

3-cu. yd. weighing hopper installed expressly for serving truck deliveries of batched materials as well as transit-type mixer trucks.

A stock-pile system has been arranged to take care of the excess materials from the Heltzel bin.

Tractor and portable belt conveyor for loading material.

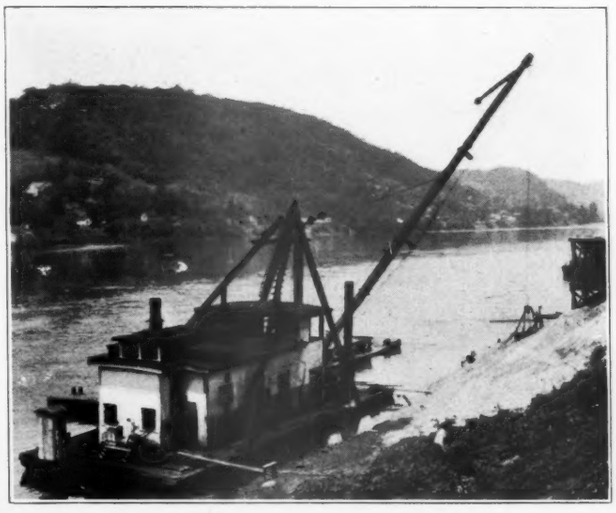
These materials are spouted to a Fairfield portable conveyor which builds up stock-piles storing up to 40,000 tons. For reclaiming the stocked materials, a Northwest ¾-cu. yd. crane is used which also serves to load cars on an adjacent sidetrack. Sand is reclaimed from the stock-piles by a Barber-Greene loader.

A Caterpillar "Thirty" tractor equipped with an

One of the mixing trucks leaving the batcher.

oil-pressure operated bulldozer finds extensive utility in and about the plant for car moving, yard clean-up, and in moving the portable conveyor to and from stock-pile locations.

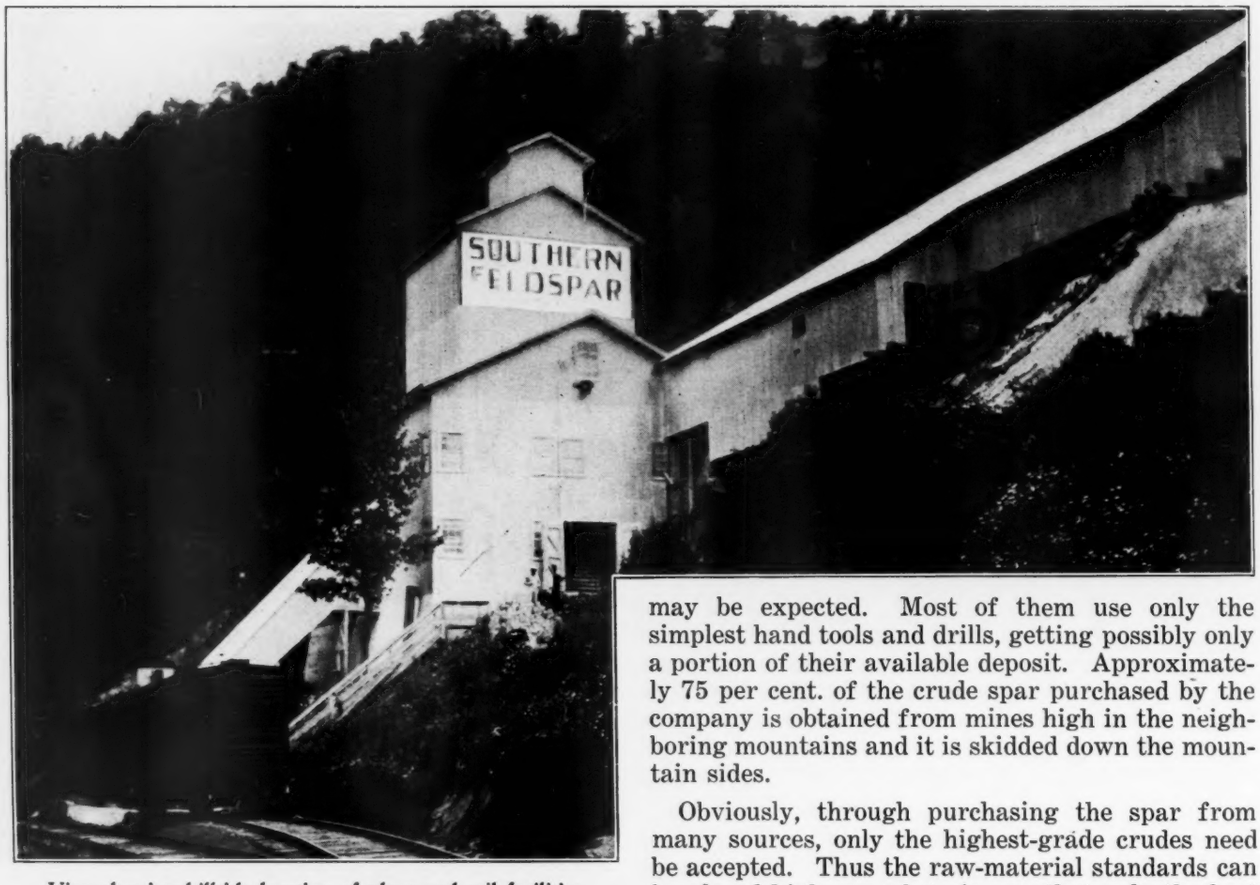
The H. L. Seabright Co., which operates a fleet of four Jaeger Dual Mix transit mixers mounted



Derrick boat unloading barge to hopper.

on Autocar trucks, obtains its aggregates from the Independent Sand Co. The Seabright company has installed its own cement bin and weighing-hopper apparatus on the new aggregate company site. This equipment was furnished by the Heltzel Steel Form & Iron Co. and has a capacity sufficient to store 2 carloads of cement. Carloads of bulk cement arrive on an adjacent sidetrack and are unloaded by means of a power shovel.

Feldspar-Grinding Plant Purchases Raw Material from Independent Miners

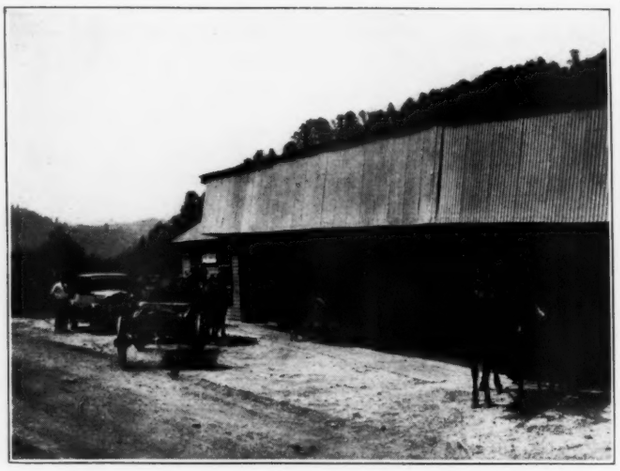


View showing hillside location of plant and rail facilities.

SINCE the completion of its new feldspar-grinding plant at Toecane, N. C., the Golding-Keene Co., Keene, N. H., has placed its "hat in the ring" in the North Carolina feldspar district. In this district, since the advent of the Toecane operation, the industry is located in three principal centers which form a triangle, the points being at Spruce Pine, Toecane, and Micaville. The new Golding-Keene plant is operated under the name of Southern Feldspar, Inc. It is the third Golding-Keene unit, the others being located at Keene, N. H., and Trenton, N. J. Chas. E. Golding is president of the three companies, which, as combined, are said to form the largest independent producer of feldspar in the country. J. O. Dennis is manager of the Toecane division.

Southern Feldspar, Inc., does not mine crude feldspar, preferring to purchase it from near sources. Feldspar is a common mineral in Mitchell County and excellent deposits occur almost everywhere. Because of its proximity to the surface—much of it is even exposed as outcrops—farmers engage in spar mining during their spare time. Their methods, termed "ground-hogging," are quite crude, as may be expected. Most of them use only the simplest hand tools and drills, getting possibly only a portion of their available deposit. Approximately 75 per cent. of the crude spar purchased by the company is obtained from mines high in the neighboring mountains and it is skidded down the mountain sides.

Obviously, through purchasing the spar from many sources, only the highest-grade crudes need be accepted. Thus the raw-material standards can be placed high enough to insure that only the best grades are brought to the plant. Likewise, a wider diversity in the grades of crude spar can be obtained than if the company owned one or more mines. Then, too, Southern Feldspar, Inc., has no investment in mining equipment, deposits and the like. During periods of slackened output, no mining em-



Farmers' teams arriving to unload crude spar to the bins.

Partitions forming the crude-spar bins.

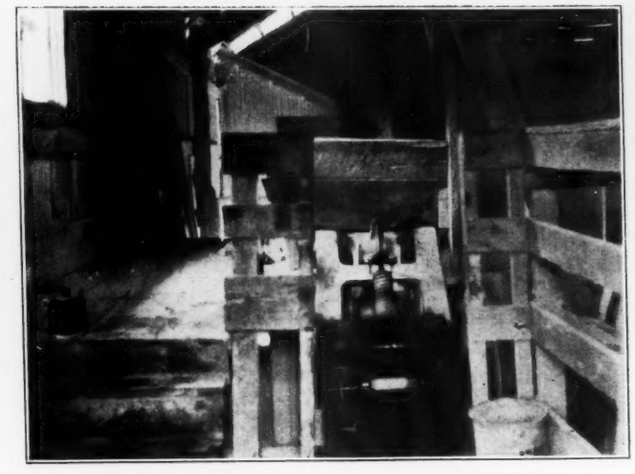
ployees are laid off, the farmers who supply the feldspar merely have more time on their hands, since their income from the spar production is in addition to their regular sources.

Being but a crushing-and-grinding plant, Southern Feldspar, Inc., operations are relatively simple —merely a primary reduction through a jaw crusher and finish grinding in tube-mills to pottery or glass manufacturers' specifications.

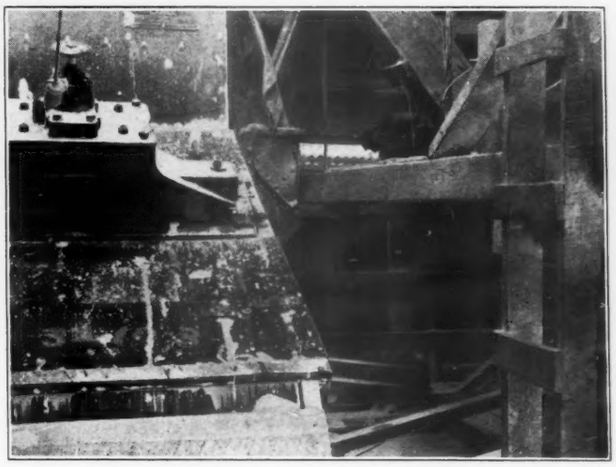
Gravity plays an important part in the flow of materials through the plant because of a fortunate hillside location. Skirting the bank of the North Toe River, the Clinchfield Railroad passes the foot of the plant, while, on a bench along the hillside, a county highway passes, leading to Bakersville. The hillside thus forms an ideal location for the plant.

Farmers bring the crude material in small wagons or trucks to the receiving bins which adjoin the county road. Near the bins are the company's office and scale-house, where each load of spar is weighed and inspected before acceptance. The farmer is then instructed into which bin his spar is to be unloaded. A truck-load a day is the average amount produced by a farmer. In the bin structure are six bins which store a maximum of 500 tons, a different grade in each bin. As the spar is dumped into the bins from the road, the dumping position is higher than the maximum height reached by the piles. Thus the bins can be loaded to capacity without additional handling.

As each of the six bins contains a different grade of spar, the crude material is sent to the crusher from selected bins according to the composition requirements of the finished product. Wheel-barrows loaded by hand and dumped directly into a Reliance jaw crusher form the means of transporting the material from the bins. The jaw crusher is set at ½ in. and material from it is received on a 14-in. belt conveyor which delivers it to a 150-ton bin in the grinding mill.

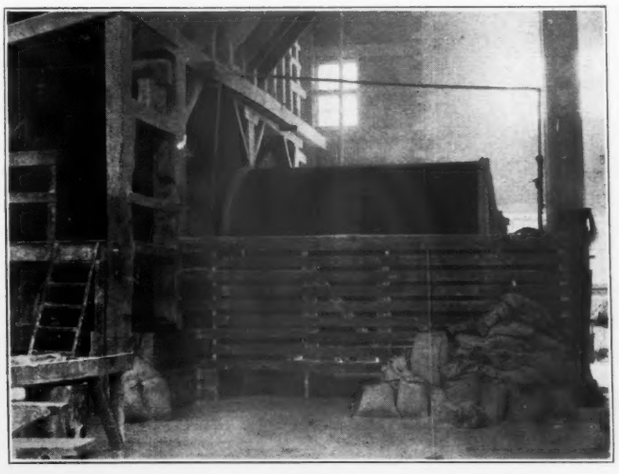


Crusher which reduces spar to minus ½ in.



Vibrating screens and chutes to centrifugal separator at right.

Pottery specifications demand a spar ground to such fineness that 93 per cent. of it must pass a 325-mesh screen. In the manufacture of glass, specifications require a fineness of only 100 per cent. through a 20-mesh screen. To meet specifications as widely divergent as these, the output of the tube-mills is sent either to a vibrating screen for the classification of the coarse product or to a centrifugal separator for the 325-mesh-screen material.



One of the tube mills in the grinding department.

Two 8-ft. by 10-ft. tube-mills, built by the Patterson Foundry & Machine Co., grind the minus-½-in. spar from the feeder-bin mounted overhead

J. O. Dennis, manager of the Toecane plant, standing in front of wagon.

into either size of product as required. Each mill is lined with Jasper Stone Co. lining and contains a 12-ton charge of French flint pebbles as a grinding medium. These are used to insure a clean white product free from iron or discoloration. When grinding the 325-mesh product, the hourly output per mill is placed at 1¾ tons. When grinding the 20-mesh product, the capacity increases to 3 tons per hr. per mill. Each mill is driven by a 100-hp. Allis-Chalmers motor through a Texrope drive.

Discharge is made by both mills to the boot of a belt-bucket elevator which delivers the ground product either to the vibrating screen or directly into a Gayco 14-ft. centrifugal separator, depending on the fineness required. Normally a Tyler Hum-mer vibrating screen, with 4-ft. by 5-ft. panels of screen cloth (12 to 20 mesh as required), separates the ground spar for the glass specification. A Sturtevant unit of similar size is mounted adjacent to the Hum-mer to act as a stand-by. "Oversize" rejected by the screens or the Gayco separator is returned to the tube-mills feed-bin. Finished ground spar is spouted to a bin or direct to box-cars on the adjoining side-track. Cars are usually weighed while standing on the track by a Howe 100,000-lb. capacity track-scale.

Plant office and spar-receiving platform.

As in all modern mineral-production plants, a laboratory check is made on raw materials. Southern Feldspar, Inc., places its raw materials directly under the control of the Sharp-Schurtz Co. of Lancaster, Ohio. Analyses are frequently made of the crude spar in numbers sufficient to provide an accurate control over the product passing through the mill at all times.

Dock Facilities Eliminate Rehandling

(*Continued from page 36*)

gravel is spouted to barges tied alongside the dredge. Two thousand five hundred tons is the daily (12-hr.) output of the dredge.

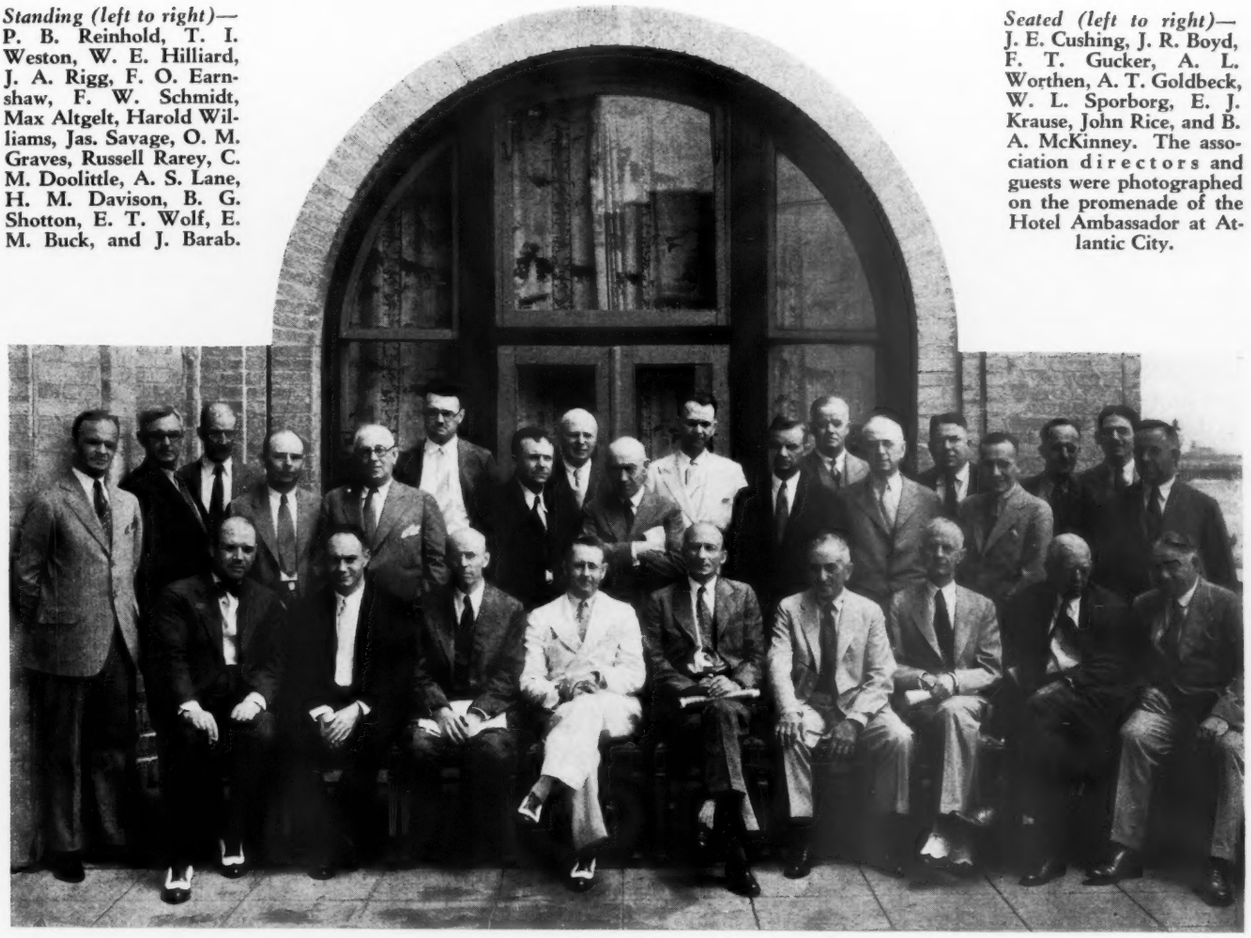
In the absence of barges, or during a lull in consumption, stock-piles of sand and gravel are made in the pond based on the floor of the dredged-out land. Here some 300,000 tons of material is stored, most of which may be under water to a depth of 18 to 24 ft. This material is recovered as needed by derrick-scows. The derrick-scow *Little Giant,* used for this purpose, has a 1-cu.yd. clam-shell bucket and a 38-ft. boom. The *Cecil,* also used for stock-pile storage and reclamation, has a 66-ft. boom and is equipped with a 2-cu.yd. bucket.

Material from the stock-piles is sent through a recrushing process when a large amount of one grade of aggregate is needed. For this purpose a floating recrushing plant has been built. This unit, which replaces an earlier one destroyed by fire, has a 28-ft. by 100-ft. hull, 7 ft. high from deck to bottom. Its principal equipment consists of a Symons 3-ft. cone crusher and a 7-ft. revolving screen with a complete steam power-plant. In operation, one of the derrick scows is towed to a position at the pile, and the recrushing-plant scow is anchored near. A hopper aboard the latter scow receives the recovered material and feeds it directly to the Symons crusher or to the revolving screen. The crusher may produce a ¾-in.-to-¼-in. gravel from a 1½-in. material, or any class of recrushed material required by merely changing the crusher setting and the revolving-screen panels. The screen and the crusher operate in closed-circuit, and sized materials from the screen are spouted direct to barges tied alongside. Steam is furnished aboard the recrushing plant by a 100-hp. boiler to a Nagle 85-hp. steam engine, which is the source of power for the crusher and screen equipment. There is also a Dean-Hill steam-turbine-driven centrifugal pump for furnishing washing water. The pump is rated at 1,000 gal. per min. at a 60-ft. head. Based on average recrushing conditions, the plant has a daily capacity of 900 tons.

For its river traffic to and from the five Virginia docks, the company operates 58 barges, or scows as they are locally termed, 31 of which are owned and 27 which are operated under contract. The scows are all 28 ft. by 100 ft. in dimensions and are built of wood. Their rated capacity is 300 tons each. For towing the barges, the company operates the *A. G. Bigelow* and the *Uncle Sam,* both steam-engine-driven. The *L. U. Jr.* is the only gas-engine-driven tow-boat of the fleet.

Standing (left to right)— P. B. Reinhold, T. I. Weston, W. E. Hilliard, J. A. Rigg, F. O. Earnshaw, F. W. Schmidt, Max Altgelt, Harold Williams, Jas. Savage, O. M. Graves, Russell Rarey, C. M. Doolittle, A. S. Lane, H. M. Davison, B. G. Shotton, E. T. Wolf, E. M. Buck, and J. Barab.

Seated (left to right)— J. E. Cushing, J. R. Boyd, F. T. Gucker, A. L. Worthen, A. T. Goldbeck, W. L. Sporborg, E. J. Krause, John Rice, and B. A. McKinney. The association directors and guests were photographed on the promenade of the Hotel Ambassador at Atlantic City.



Pittsburgh Chosen for 1932 Convention as N. C. S. A. Directors Gather

DIRECTORS of the National Crushed Stone Assn. gathered at Atlantic City, July 24 and 25 in their semi-annual meeting and selected the William Penn Hotel at Pittsburgh for the 1932 convention. The gathering is to take place from January 19 to January 22 and will precede the annual meeting of the National Sand and Gravel Assn., to be held at the same place, by one week.

The choice of Pittsburgh for the 1932 convention was made only after careful and thoughtful consideration had been given to the many invitations which had been received by the Board from the leading cities and hotels in the United States and Canada. That the competition for the annual convention of the association is keen is evidenced by the fact that the following representatives appeared before the board with invitations for the 1932 meeting: H. C. Bush, Cunard Lines; John Bowman, Stevens Hotel, Chicago, Ill.; C. A. Royston, New Chamberlain Hotel, Old Point Comfort, Va.; A. M. Rosenthal, Hollywood Beach Hotel and Golf Club, Hollywood-by-the-Sea, Fla.; J. M. Stuart, Seaboard Airline Railroad; R. F. Hall, West Baden Springs Hotel, West Baden, Ind.; F. L. Andrews, William Penn Hotel, Pittsburgh, Pa.

Formal invitation to come to Pittsburgh was presented by Paul Reinhold, secretary of the Pennsylvania Stone Producers' Assn.

A. L. Worthen, president, acted as chairman of the sessions. A detailed analysis of the financial condition of the association was presented to the board, it being left to the Executive Committee to determine upon the budget of expense anticipated for the second six months of operation from July 1 to Dec. 31, 1931. A sound financial condition was reflected by the reports presented, indicating that the association's activities could be continued during the remainder of the year without curtailment.

President Worthen reported to the board that excellent progress had been made in raising the special research fund of $10,000 which is to be devoted primarily to extending the scope, breadth and effectiveness of the association's research activities. The attitude of the board was decidedly favorable to continued efforts being made towards the raising of the total amount of this fund, and a number of those present pledged increased support.

A. T. Goldbeck, director of the Bureau of Engineering of the association, in his report, directed attention to the research investigations which had been under way in the laboratory during the first six months of the year, including soundness tests on various coarse aggregates and water-cement pastes of different proportions, the suitability of stone-sand for use as fine aggregate in concrete construction, and a series of stability tests on various types of railroad ballast. Paul Reinhold, chairman of the research advisory committee, also read his report for the first half of the year.

W. R. Sanborn, chairman of the Transportation Committee of the association opened the morning session on Saturday with a detailed and comprehensive report dealing with the application of the carriers to the Interstate Commerce Commission for a 15-per cent. horizontal increase in freight rates. Mr. Sanborn's report was based on replies which he had received from questionnaires sent out to various key men of the industry with regard to the proposed increase. The proposed increase was considered as of paramount importance to the crushed-stone industry and a very large part of the Saturday morning session was devoted to a *pro* and *con* discussion of the various factors which would be involved. It was brought out that, under the present rates, the railroads are losing crushed-stone traffic to motor trucks and it was felt that a 15-per cent. increase in crushed-stone rates would decrease the revenue derived by the carriers from hauling crushed stone because of the further divergence of crushed-stone traffic to trucks.

The opinion was also generally expressed that an increase in freight rates on crushed-stone would encourage the construction of local plants where the hauling would be by truck exclusively. A resolution was passed by the board in which authority was given for employing counsel in the presentation of the case before the Interstate Commerce Commission. The resolution clearly indicated that the crushed-stone industry did not oppose the general increase in rates, but seriously doubted whether the increase would prove effective in so far as crushed-stone traffic was concerned in increasing the revenue of the railroads.

As chairman of the committee in charge of the adoption of trade-practice rules, Otho M. Graves reported on the rules as formulated by the association and as finally approved by the Federal Trade Commission. These are of interest to every crushed-stone producer and are as follows:

Rule 1. The Commission substituted and approved the following for Rule 1, as published April 15, 1930:

"Maliciously inducing or attempting to induce the breach of existing contracts between competitors and their customers by any false or deceptive means whatsoever, or interfering with or obstructing the performance of any such contractual duties or services by any such means, with the purpose and effect of unduly hampering, injuring, or embarrassing competitors in their business, is an unfair trade practice."

Rule 1, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The willful interference by any person, firm, corporation or association, with any existing contract between a seller and a purchaser, in or about the production, manufacture, transportation, purchase or sale of any product handled by the industry, or the performance of any contractual duty or service connected therewith, such interference being for the purpose or with the effect of dissipating, destroying or appropriating, in whole or in part, the patronage, property or business of another engaged in such industry, is an unfair trade practice."

Rule 2. The Commission approved Rule 2, as published April 15, 1930, which reads as follows:

"The false marking or branding of products of the industry with the effect of misleading or deceiving purchasers with respect to the quantity, quality, size, grade or substance of the materials purchased, is an unfair trade practice."

Rule 3. The Commission substituted and approved the following for Rule 3, as published April 15, 1930:

"The sale or offering for sale of any product of the industry by any false means or device which has the tendency and capacity to mislead or deceive customers or prospective customers as to the quantity, quality, substance or size of such product is an unfair trade practice."

Rule 3, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The sale or offering for sale of any product of the industry accompanied by misrepresentations calculated to deceive customers or prospective customers as to the quantity, quality, size, grade or substance of such product, is an unfair trade practice."

Rule 4. The Commission substituted and approved the following for Rule 4, as published April 15, 1930:

"The secret payment or allowance of rebates, refunds, commissions, or unearned discounts, whether in the form of money or otherwise, or secretly extending to certain purchasers special services or privileges, not extended to all purchasers under like terms and conditions, with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice."

Rule 4, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The secret prepayment of transportation charges and/or the secret payment or allowance of rebates, refunds, credits, or unearned discounts whether in the form of money or otherwise, or secretly extending to certain purchasers special service or privileges not extended to all purchasers under like terms and conditions, with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice."

Rule 5. The Commission substituted and approved the following for Rule 5, as published April 15, 1930:

"It is an unfair trade practice for any person engaged in interstate commerce, in the course of such commerce, either directly or indirectly, to discriminate in price between different purchasers of commodities, where the effect of such discrimination may be to substantially lessen competition or tend

to create a monopoly in any line of commerce; provided that nothing herein contained shall prevent discrimination in price between purchasers of the same class on account of differences in the grade, quality or quantity of the commodity sold, or that makes only due allowance for differences in the cost of selling or transportation, or discrimination in price in the same or different communities made in good faith to meet competition; and provided further, that nothing herein contained shall prevent persons engaged in selling the products of this industry in commerce from selecting their own customers in bona fide transactions and not in restraint of trade."

Rule 5, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"Any discrimination in price between purchasers of the same class, not including discrimination in price on account of the difference in grade, quality or quantity of the product sold, or which makes only due allowance for difference in cost of selling and transportation, or discrimination in price in the same or different communities made in good faith to meet competition, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly, is an unfair trade practice."

Rule 6. The Commission substituted and approved the following for Rule 6, as published April 15, 1930:

"The defamation of competitors by falsely imputing to them dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representations, or the false disparagement of the grade or quality of their goods, with the tendency and capacity to mislead or deceive purchasers or prospective purchasers, is an unfair trade practice."

Rule 6, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The defamation of a competitor by words or acts imputing to him dishonorable conduct, inability to perform contracts, or questionable credit standing, or the false disparagement of the grade or quality of his materials, is an unfair trade practice."

Rule 7. The Commission approved Rule 7, as published April 15, 1930, which reads as follows:

"The selling of goods below cost with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice."

Rule 8. The Commission substituted and approved the following for Rule 8, as published April 15, 1930:

"Directly or indirectly to give or permit to be given or offer to give money or anything of value to agents, employees, or representatives of customers or prospective customers, or to agents, employees or representatives of competitors' customers, or prospective customers, without the knowledge of their employers or principals, as an inducement to influence their employers or principals to purchase or contract to purchase industry products from the maker of such gift or offer, or to influence such employers or principals to refrain from dealing or contracting to deal with competitors, is an unfair trade practice."

Rule 8, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The secret paying, or promising to pay, to an employee of a customer or prospective customer, without the knowledge of his employer, of a commission or consideration of any character for the purpose of inducing or compensating for a sale, is an unfair trade practice."

Rule 9. The Commission substituted and approved the following for Rule 9, as published April 15, 1930:

"Maliciously enticing away the employees of competitors with the purpose and effect of unduly hampering, injuring, or embarrassing competitors in their businesses is an unfair trade practice."

Rule 9, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The enticement of employees from a competitor for the purpose of interfering with his business is an unfair trade practice."

Rule 10. The Commission substituted and approved the following for a part of Rule C, Group II, as published April 15, 1930:

"Offering for sale merchandise at a price reduced from a marked-up or fictitious price with the tendency and capacity to mislead or deceive purchasers or prospective purchasers is an unfair trade practice."

Rule A, Group II. The Commission substituted and accepted the following for a part of Rule C, as published April 15, 1930:

"(a) The industry approves the practice of each individual member of the industry independently publishing and circulating to the purchasing trade its own price lists.

"(b) The industry approves the practice of making the terms of sale a part of all published price schedules."

Rule C, as published April 15, 1930, which the Commission declined to approve or accept, reads as follows:

"The industry hereby records its approval of the practice of each individual independently publishing his prices and terms of sale to the purchasing trade. The publication of fictitious prices and terms of sale by a manufacturer for the purpose of misleading the trade and the public is condemned by the industry."

Rule B. The Commission substituted and accepted the following for Rule D, as published April 15, 1930:

"A Committee on Trade Practices is hereby created to coöperate with the Federal Trade Commission and to perform such acts as may be proper to put these rules into effect."

Rule D, as published April 15, 1930, which the Commission declined to approve or accept reads as follows:

"The Crushed Stone Industry hereby authorizes the National Crushed Stone Association to take such steps as may be necessary to appoint a Committee on Trade Practices to investigate whether these resolutions are being observed, to make complaints concerning alleged violations, coöperate with the Federal Trade Commission and generally to perform such other acts as may be reasonably necessary and proper to put these resolutions into effect and to accomplish the objects and purposes of this conference."

The Commission declined to approve or accept the following rules as published April 15, 1930:

Rule A, Group II. "The offering or giving of commissions, prizes, premiums, gifts or excessive entertainment to

anyone in connection with the sale, purchase or use of any product distributed by manufacturers within this industry, or as an inducement thereto, is condemned by the industry."

Rule B, Group II. "The practice of making sales on an f.o.b. factory basis on all shipments except within local delivery limits enables the purchaser to know the cost of the product, exclusive of freight charges, and is a commendable custom and recommended by the industry."

The manual on uniform cost accounting, authorized at the last convention at St. Louis, is now ready for distribution, it was announced by W. E. Hilliard, chairman of the committee dealing with that subject. It was pointed out that the figures employed in the manual were for the purpose of illustration only.

Max A. Altgelt of New Braunfels, Tex., came the longest distance to attend the meeting. The registration was as follows:

Franz Altgelt, New Braunfels, Tex.
Max A. Altgelt, Servtex Materials Co., New Braunfels, Tex.
C. B. Andrews, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Wm. M. Andrews, Lake Erie Limestone Co., Youngstown, O.
J. Barab, Hercules Powder Co., Wilmington, Del.
J. R. Boyd, National Crushed Stone Assn., Washington, D. C.
E. M. Buck, PIT AND QUARRY, Chicago, Ill.
J. E. Cushing, Cushing Stone Co., Schenectady, N. Y.
H. M. Davison, Harnischfeger Sales Corp., Milwaukee, Wis.
C. M. Doolittle, Canada Crushed Stone Corp., Hamilton, Ont., Canada.
F. O. Earnshaw, Carbon Limestone Co., Youngstown, O.
A. T. Goldbeck, National Crushed Stone Assn., Washington, D. C.
Otho M. Graves, General Crushed Stone Co., Easton, Pa.
F. T. Gucker, John T. Dyer Quarry Co., Norristown, Pa.
Wm. E. Hilliard, New Haven Trap Rock Co., New Haven, Conn.
E. J. Krause, Columbia Quarry Co., St. Louis, Mo.
A. S. Lane, John S. Lane & Son, Inc., Meriden, Conn.
E. G. Lewis, Bucyrus-Erie Co., New York, N. Y.
B. A. McKinney, West Roxbury Trap Rock Co., West Roxbury, Mass.
Russell Rarey, Marble Bluff Quarries Co., Columbus, O.
P. B. Reinhold, Reinhold & Co., Inc., Pittsburgh, Pa.
John Rice, General Crushed Stone Co., Easton, Pa.
J. A. Rigg, Acme Limestone Co., Alderson, W. Va.
N. C. Rockwood, *Rock Products*, Chicago, Ill.
W. R. Sanborn, Lehigh Stone Co., Kankakee, Ill.
James Savage, Buffalo Crushed Stone Co., Buffalo, N. Y.
F. W. Schmidt, North Jersey Quarry Co., Morristown, N. J.
B. G. Shotton, Chairman of Manufacturers' Division—Hendrick Mfg. Co., Pittsburgh, Pa.
W. L. Sporborg, General Crushed Stone Co., Syracuse, N. Y.
T. I. Weston, Weston & Brooker Co., Columbia, S. C.
Harold Williams, Boston, Mass.
E. T. Wolf, E. I. duPont de Nemours and Co., Inc., Narberth, Pa.
A. L. Worthen, The Connecticut Quarries Co., New Haven, Conn.

Domestic Graphite Production Down Sharply During 1930

The total quantity and value of graphite sold by graphite miners in the United States in 1930 were considerably smaller than the corresponding figures for 1929, according to a statement by the U. S. Bureau of Mines, Department of Commerce. The sales of natural amorphous graphite by producers in 1930 were 1,941 tons, valued at $20,525. In comparison with 1929, there was a decrease of 1,641 tons, or 45 per cent. in quantity, and of $26,125, or 56 per cent. in value. Because only two operators reported sales of crystalline graphite in 1930, it is impossible to publish figures without disclosing confidential information. Statistics of sales of graphite were collected in coöperation with the Geological Surveys of Alabama and Michigan.

The states reporting the sale or use of graphite by the miner in 1930 were Alabama, Michigan, Nevada, and Rhode Island. Alabama was the only state reporting sales of crystalline graphite in 1930.

Uniform Sales Distribution Sought by Japan's Cement Dealers

Uniformity of sales distribution of cement in Japan, at present so lacking as to partially disrupt the industry, is to be made the subject of serious study by dealers in that country.

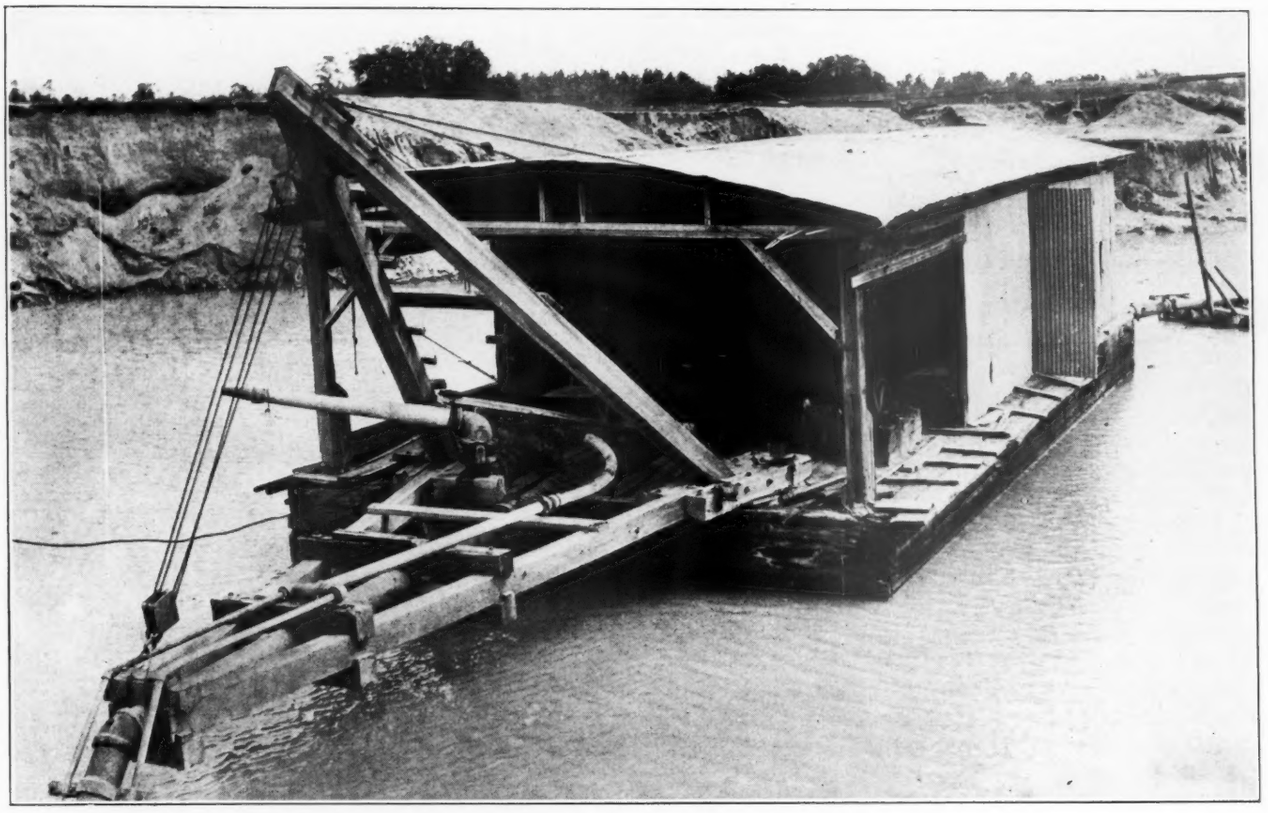
The Japanese cement producers already have an organization which attempts to regulate production. Now the dealers in seven cities, with headquarters in Tokyo, are drafting a plan, under direction of several committees, which will be intended to regulate distribution of the product. At present distribution is said to be so uncertain as to be a serious menace to trade expansion. One of the chief functions of the proposed regulatory body would be to control the marketing quantity of cement. As now organized, the dealers pay little attention to quota allotments in various cities, overselling their stated quantity in some cities, and selling less in others, paying fines in both cases for infractions of their central agreement.

Campaign Teaches Children Not to Play with Blasting Caps

Organizations both state and national are working in a united effort to protect children from the dangers of playing with blasting caps. It is being realized more and more that the safety of the young people depends on the education of both the adults and youth of the country. One of the menaces to public health is the carelessness of grown-ups and workmen in leaving blasting caps where children can find them. Following blasting operations, caps are often carried home and children are not advised of their danger. Workmen put them in their pockets and, in various ways, they are pulled out and left lying along highways or near the scene of work. Caps left near construction and quarry operations are responsible for a number of tragedies, as childish curiosity leads the victims to these haunts day after day in search of adventure.

The interest in the campaign to protect children from the dangers of playing with blasting caps has grown from day to day since its inception by the Institute of Makers of Explosives in June, 1926. Although specific warnings are given to buyers to see that blasting caps are not left where children can find them, approximately 500 boys and girls under sixteen years of age are injured each year as the result of playing with them. Sometimes five and six children are injured in one detonation.

Florida Sand Producers' Merger Lowers Overhead and Operating Costs

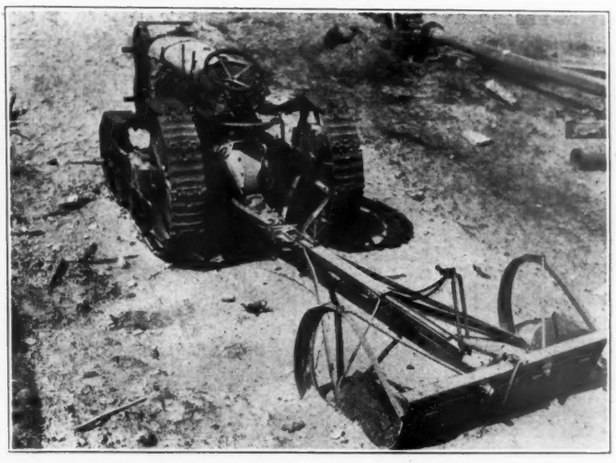


Close-up view of the dredge showing A-frame and hydraulic equipment.

THROUGH the merger of two well-known Florida aggregate firms on Apr. 1, 1931, numerous economies of operation were effected. Besides the advantage gained in the consolidation of sales and management staffs, which brought about a great reduction in overhead, considerable operating economy resulted.

The two concerns in question are the Diamond Sand Co. and the Interlachen Sand Co., now known as the Diamond-Interlachen Sand Co. with headquarters at Jacksonville, Fla. The operations at the Interlachen plant were found to be entirely satisfactory for the combined companies and of sufficient capacity to meet the requirements of the merger. Thus the operating expense is reduced enormously. At the same time, one plant, supplying the needs of two formerly separate companies, naturally operates nearer to its capacity and consequently functions more efficiently.

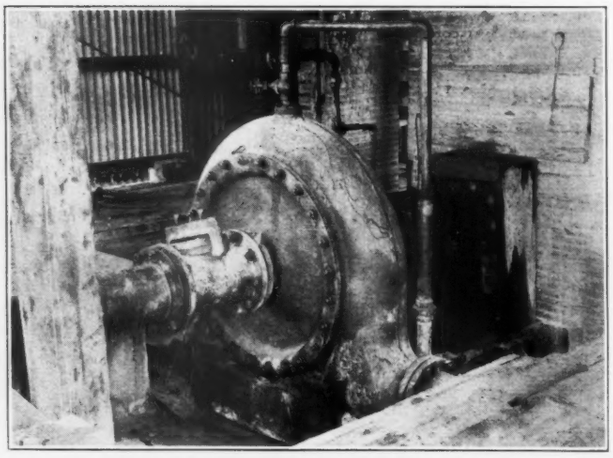
Tractor-Drawn Scraper Used to Remove Overburden at Interlachen Operations



Tractor and scraper used for stripping.

Officers of the former companies remain with the new company. S. D. Gooch, formerly vice-president of the Diamond Sand Co., is president of the new company; J. D. Baker and T. S. Baker, former officials of the Interlachen Sand Co., are now vice-president and secretary-treasurer, respectively, of the new company. L. D. Smith continues as superintendent at the Interlachen plant.

The Interlachen plant was operated formerly as a pit employing the shovel-excavation method with a Plymouth locomotive and a train of pit cars used as a medium of intraplant transportation. Bank

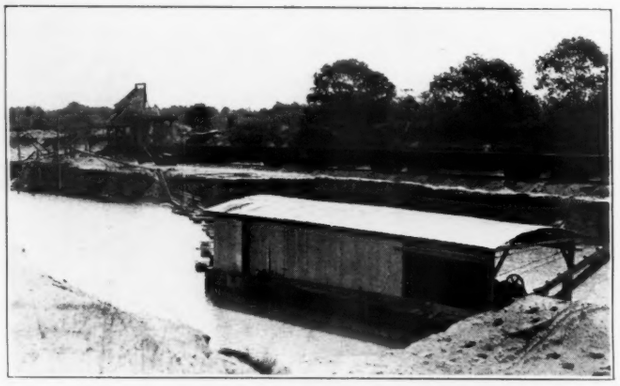


A view of the 8-in. dredge pump.

sand and clay-gravel were produced. Following a reduction in demand for the clay-gravel, the old method of recovery was abandoned in favor of a hydraulic dredge. Now the principal product is washed sand produced in two grades by two Link-Belt automatic sand-settling cones.

A light overburden of sandy loam is removed by a crawler-tractor-drawn scraper—a method discussed in some detail in recent articles on crawler tractors published in PIT AND QUARRY. At the Interlachen plant a Fordson tractor, equipped with Trackson crawlers, draws a Gustav Schaeffer 13-cu. ft. scraper. The combination offers a rapid and flexible method of stripping and has the added advantage of low cost, an important consideration where stripping does not justify more expensive equipment. Then, too, the tractor is serviceable in other ways about the plant. At "Interlachen" a 2-drum Willamette-Ersted hoist is mounted on the front of the tractor for moving cars and machinery.

The dredge has a 20-ft. by 40-ft. wood hull built of long-leaf-pine timbers. Its equipment consists principally of a Georgia Iron Works 8-in. centrifugal sand-pump with an A-frame suction-pipe mounting. One A-frame is fixed permanently at an angle of approximately 45 deg. to the water. From this frame a wire-rope tackle supports the suction-pipe A-frame, which is hinged to the hull, and supports the suction-pipe in its various positions. No cutting-head or chain is needed for this deposit, although a system of jets, attached to the suction end of the suction-pipe, has proved quite successful in loosening the sand. The sand bank is avalanched by means of a Georgia Iron Works hydraulicking nozzle, having a 1¾-in. tip. Water at a pressure of 100 lb. per sq. in. is delivered to the gun by a 5-in. by 4-in. centrifugal pump at the rate of 600 gal. per min. The pump is direct-connected to a 60-hp. motor.



The plant, pipe-line and dredge.

A 3-drum hoist, the drums of which are mounted on a single shaft and are operated through individual clutches, controls the dredge anchor lines and the A-frame dredging positions.

In following the flow of material from the dredge through the plant, it will be seen that the complete process is extremely simple with but few mechanical items. As stated, a Georgia Iron Works 8-in. pump dredges the material from the pond. It is connected to the suction-pipe on the A-frame by means of a Cincinnati Rubber Co. suction hose and is driven by a 125-hp. Allis-Chalmers motor. At the plant the pipe-line discharge is received on a 4-ft. by 8-ft. panel of ½-in.-mesh wire-cloth screen which separates plus-½-in. gravel. Another screen panel, 4 ft. by 10 ft. in size with ⅜-in.-mesh wire cloth, separates pea gravel. Material passing the latter screen is divided and flumed to two Link-

(*Continued on page 56*)

Settling-tank installation. Note spreader at discharge from cone.

L. D. Smith, superintendent, and E. L. Tanner, dredge operator.

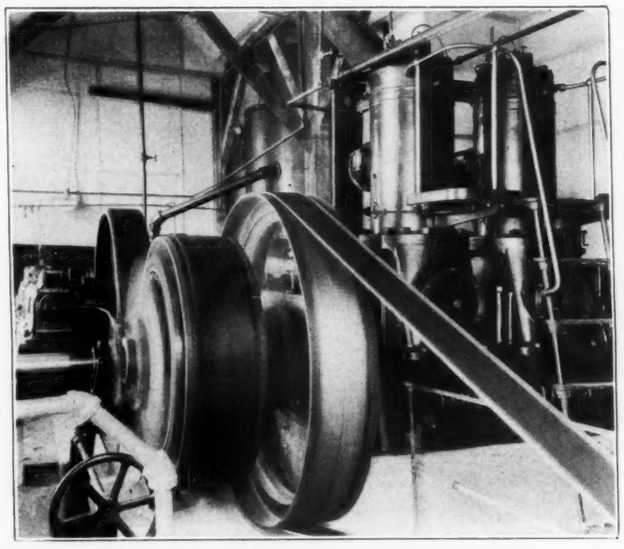
Granite Plants Install Diesel Engines to Supply Power Requirements

Find Plant-Generated Energy Lower in Cost Than Purchased Electric Current

By V. O. HARKNESS
Manager, Diesel Engine Dept. Fairbanks Morse & Co., Boston, Mass.

IN the immediate neighborhood of Barre and Montpelier, Vt., there occurs an outcropping of a very excellent grade of granite which is known and marketed throughout the country. The district supports a thriving quarrying and stone-cutting industry and competition among the operators in excellence of workmanship and economy of operation is keen. How a number of companies have solved the operating-cost problem is of interest in that it serves to show where marked savings may be effected by the substitution of Diesel-engine power for purchased electric current.

As an illustration of just what these savings can amount to, three examples are cited as sufficient operating data are available to give a definite indication of the cost of operation as compared with



A 120-hp. Diesel engine supplies power for pneumatic tools and auxiliary equipment at the plant of the Jurras Granite Co.

that of purchased electric power. These installations are those of the Jurras Granite Co. at Montpelier, the Eureka Granite Co. at Montpelier, and W. A. Lane at Barre, Vt.

The Jurras Granite Co. is engaged in the manufacture of granite memorials and head pieces. In the spring of 1929 an investigation of the power costs revealed the fact that they were reaching such proportions that some step had to be taken to improve the situation. At that time this plant was purchasing all its electric current. The investigation revealed the fact that a substantial saving could be effected by the installation of Diesel-engine equipment to manufacture electric current.

This plant, in common with all other granite-manufacturing establishments, has a load which is made up principally of the power requirements of the air-compressor, which furnishes compressed air for the operation of the pneumatic stone-dressing machines, and, in addition, a small amount of auxiliary power which is usually supplied by an individual motor on each machine.

Acting on the findings of the investigation, the Jurras company installed a Fairbanks-Morse 120-hp. Model 32B Diesel engine equipped with a clutch pulley for belt-driving the air-compressor and an additional belt drive off the flywheel to operate a 60-kv.-a., 3-phase, 60-cycle, 240-v., F-M alternator which was also installed at the same time to furnish power for the electrical equipment around the plant. The air-compressor is 14 in. by 9 in. by 12 in. and is rated at 446 cu. ft. of free air per min. which requires a 100-lb. pressure and 76 b.hp.

The motors for which current is supplied by the belted alternator are as follows:

One 40-hp. unit operating two large and one small polishers, as well as the overhead bridge-crane through the medium of a steel-cable arrangement.

One 7½-hp. motor and one 2-hp. motor driving the suction fans which remove the dust from the surface cutters.

One 2-hp. motor driving a wood cut-off saw.

One 1½-hp. motor operating a blower in the blacksmith shop.

One 5-hp. motor which operates both a trip hammer and an emery wheel.

The owner and manager of the Jurras Granite Co. purchased this property in 1921 and has since that time been paying a yearly power bill approximating $4,000 with a minimum service charge of $135 per month. To be exact, the bill for purchased power for the year 1928 was $3,930.64. The 120-hp. Diesel unit took over the load for the whole plant on July 8, 1929, and from that date up to December 19, 1929, the total operating cost, exclusive of labor, amounted to only $387.35, of which $324.82 was chargeable to fuel oil. The item of labor and superintendence for the unit is not included in this total for the reason that no extra labor is required. One of the regular employees in the plant starts and stops the engine and occasionally checks its operation in addition to his other duties.

The owner has stated that on this basis the total operating cost for Diesel power would be $939.64 per year. At this rate the Diesel unit is showing a saving of approximately $3,000 per year and will pay its entire installation cost in a period of about

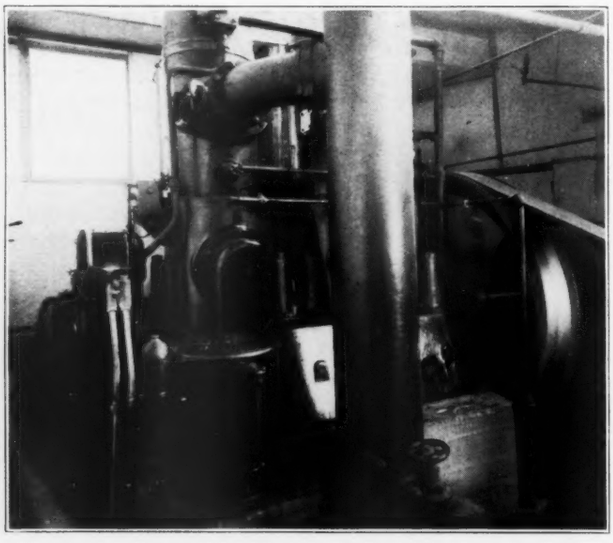
three years. Needless to say, this reflects itself in greatly reduced operating costs.

The Eureka Granite Co. of Montpelier, Vt., furnishes another case where the installation of a Diesel engine has resulted in a marked saving. In this case the unit is also a 120-hp. Fairbanks-Morse engine which was installed in the autumn of 1928, and it may be said that it was largely because of the results obtained on this installation that the installations at the Jurras Granite Co. and in the plant of W. A. Lane were made.

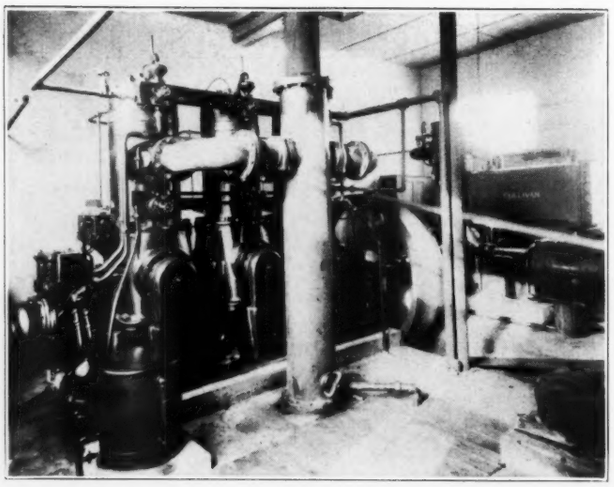
The Eureka installation is almost an exact duplicate of the one at the Jurras company except that a 40-kv.-a. Fairbanks-Morse alternator, instead of a 60-kv.-a. unit, is belted to the engine flywheel. The difference in the size of the alternators is due to the fact that, in the Eureka plant, each piece of equipment has an individual motor instead of the 40-hp. group-drive motor used in the Jurras plant. For this reason the largest single motor in the Eureka plant has a rating of 20 hp. and the starting kilovolt-amperage required is much less. Detailed operating costs for the first eight months of 1929—see table below—show exactly what power is costing in this installation. While detailed costs from August on are not readily available, this same average obtains for the rest of the year and the savings effected against a purchased-power rate of 3 c. per kw.-hr. amount to approximately $2,600 per year.

COST OF OPERATION OF DIESEL ENGINE AT EUREKA GRANITE CO. PLANT

	Lubricating Oi (*Qt.*)	Fuel Oil (*Gal.*)	Hours Operated	Total Cost
January	56	853	193	$61.43
February	74	930	190¼	68.86
March	57	1,096¾	221½	76.80
April	75	1,312¼	258	92.89
May	51	1,132¾	211½	78.19
June	45	1,040¼	192	71.57
July	42	915¾	194	63.32
August	32	930½	198	62.80
Total (8 months)	432	8,211¼	1,658¼	$575.86



At the Eureka Granite Co. this 120-hp. engine is belt-connected to an alternator and an air compressor.



A 180-hp. Diesel engine direct-connected to a compressor and belt-connected to an alternator. W. A. Lane, Barre, Vt.

It has been the experience of the Eureka company, in common with that of the other two plants mentioned, that Diesel-engine electric power is just as reliable and in every way just as satisfactory as purchased electric power and has at the same time the very marked advantage of greatly reduced cost. Since the Diesel engine was installed in this plant there has never been a shutdown due to lack of power.

W. A. Lane of Barre, Vt., owns a group of several granite sheds which he rents to manufacturing tenants, supplying them with compressed air from a central compressor plant. Until about a year and a half ago Mr. Lane was operating two 500-cu. ft., motor-driven compressors which were using purchased current, the cost of which varied somewhat but normally amounted to between $500 and $600 per month. At this rate the monthly charge had reached such proportions that it became impossible for Mr. Lane to get from his tenants the price for compressed air that would allow him a reasonable profit. Accordingly, he investigated the possibilities of generating his own power and finally came to the conclusion that a Diesel engine would solve the problem. Subsequently he installed a 180-hp. Model 32B, Fairbanks-Morse Diesel engine direct-connected to a 17-in. by 10¼-in. by 12-in. Sullivan angle compound compressor, rated at 806 cu. ft. per min., which supplied air at 100-lb. pressure.

At the same time Mr. Lane also installed an 85-kv.-a., 60-cycle, 240-v., Fairbanks-Morse alternator, belt-driven from the engine flywheel. He is now able to furnish electric power as well as compressed air to his tenants. The operation of this unit has been very successful and the savings in operating cost have been sufficient to pay for the whole installation in about three years. The tenants are much more satisfied with this arrangement than the other because of the better service afforded and the total absence of forced shutdowns which has resulted.

Yard, plant and bin structure. Cincinnati Builders' Supply Co.

Wink of "Electric Eye" Controls Batch Weights in Ohio Concrete Plant

Electric Horn Also Employed to Signal Operator When Aggregate Bins Are Full

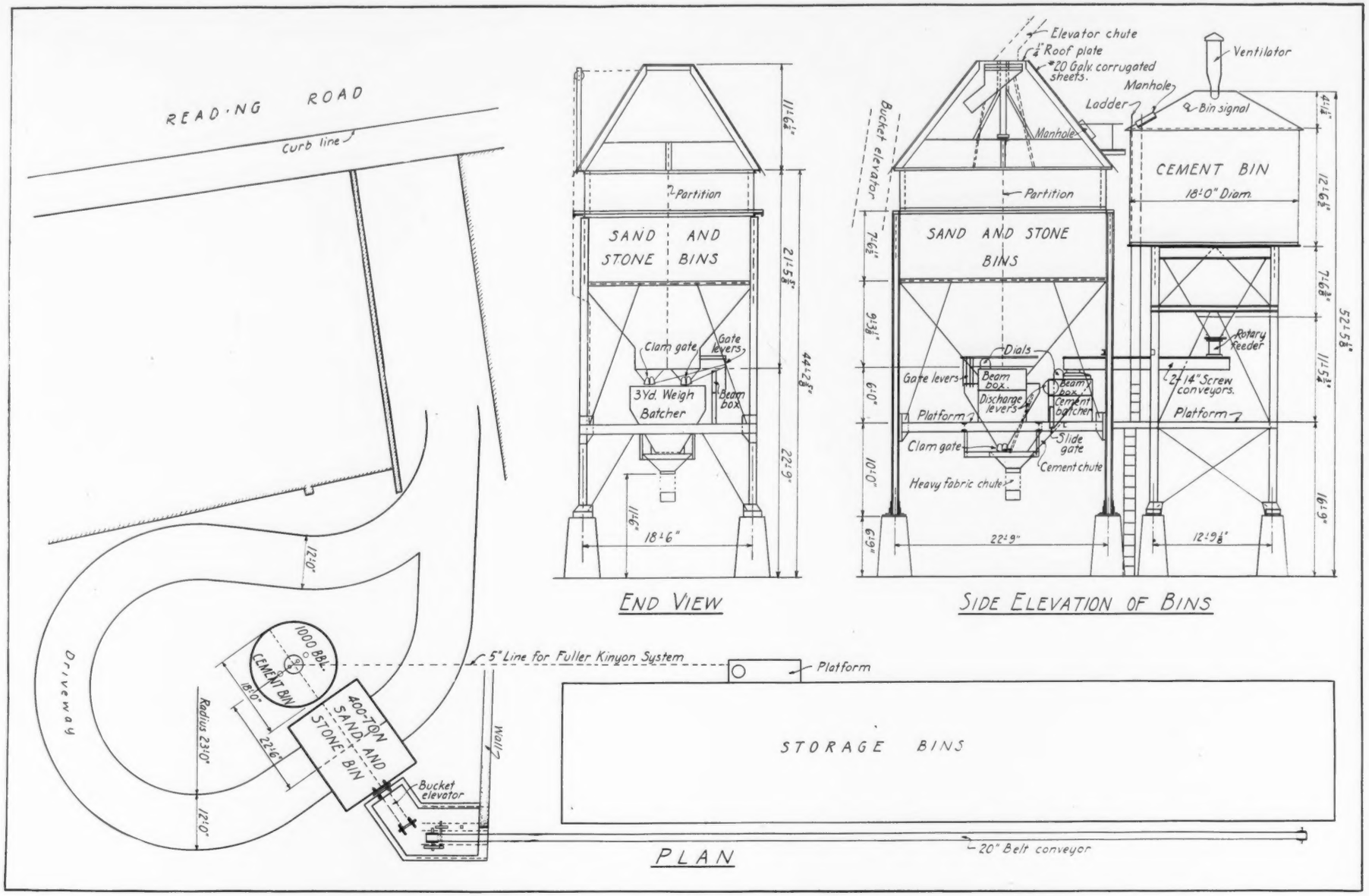
By MAT F. BEISBER

NEW premixed-concrete plants continue to hold the lime-light in the aggregate and construction industries. With two or more new plants announced each week, new improvements are brought to light, and newer refinements and conveniences demonstrate their worth. For example, a recently completed Cincinnati plant has a cement-weighing batcher controlled automatically by means a photoëlectric cell. The marvelous possibilities of this useful invention are just beginning to be revealed, and this use in connection with a ready-mixed-concrete plant is probably the forerunner of many more examples to come.

Cincinnati was one of the first large cities in which ready-mixed concrete made its debut. Today it has within its borders no less than six producers, several of which are nationally known. Two new plants were completed and placed in operation early in the summer of the present year. For some time the Cincinnati Builders' Supply Co. has had two batching plants in connection with its seven building-material supply yards in and around Cincinnati. June of 1931 saw the operation of the third ready-mixed-concrete plant, conceded to be, from the standpoints of efficiency, utility, convenience and adaptability to the conditions under which it is operated, one of the best-designed plants anywhere.

The new premixed-concrete plant of this Cincinnati company is located at its Hunt St. yard which fronts Reading Rd., one of Cincinnati's principal thoroughfares. This location is advantageous on account of its nearness to the downtown business district and the site for the new terminal for all passenger, express and freight service for all railroads entering Cincinnati. Concrete for this project is being poured under several contracts held by three of Cincinnati's ready-mixed-concrete producers.

The features of operation which headline this



Plan and elevations of the Cincinnati Builders' Supply Co. ready-mixed-concrete plant.

new concrete-producing unit are: (1) Pneumatic unloading of bulk car-loads of cement, (2) an efficient system of receiving and delivering aggregates from yard storage to the batching-plant head-bins, (3) steam heating of the aggregates in storage, (4) recombining of the aggregates in an aggregate-weighing batcher, (5) screw-conveyor delivery of cement to the weighing-batcher under photoëlectric-cell control, and (6) thorough and accurate control of truck-delivery traffic through a proper accounting system.

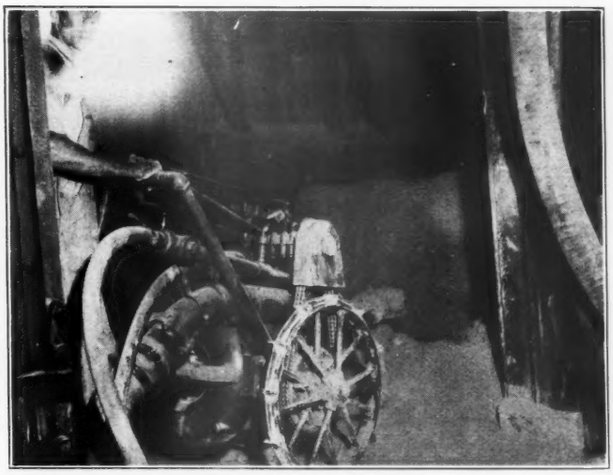
The company's plants, one located at the Avondale yard, another at the Bridgetown yard and the newest at the Hunt St. yard, are advantageously located to serve Cincinnati and its environs. The fleet of Transit-Mixer trucks operates from any of the three plants as determined by the point of delivery. It is quite possible that little or no concrete is delivered from one or two of these plants for short periods of time, deliveries being made entirely from one yard. Obviously, a smaller investment is involved in the individual plants, which are merely dry-batching depots; likewise, the operating crews are smaller in number and can readily be moved from yard to yard or transferred to building-supply-yard duties.

In planning the Hunt St. plant, a difficult problem was encountered in locating the plant with respect to the flow of aggregates from the bin-structure and the available space for truck entry, loading, and exit. From the plan drawing it will be seen that the only entry to the yard is offered by a passageway between two buildings, neither of which could be removed or altered. The yard adjacent to the bin structure offered a width of only 68 ft. between a building on the west and the brink of a sharp descent to a railroad yard on the east.

Elevator and conveyor which deliver aggregates to batching plant.

Accordingly, the aggregate and cement head-bins were located so that the trucks entering the yard turned within a circle of 23-ft. radius in approaching and leaving the loading position beneath the aggregate-weighing batcher.

The concrete plant, better termed the batching plant, contains two separate units, the aggregate head-bin with its batching apparatus beneath, and the cement bin. The former is nearly square in shape; the latter is circular and is mounted on columns set in a square figure. Being side by side the two units have their batching floor in common, completely inclosed by galvanized corrugated-iron siding with enough windows to provide lighting. The aggregate head-bin structure is 22 ft. 9 in. long, 18 ft. 6 in. wide and 55 ft. 9 in. high over all. The bin itself, without the supporting columns, is 16 ft. 10 in. high. The cement-bin structure consists of a steel tank 18 ft. in diameter and 12 ft. 6 in. high, mounted on steel columns with an overall



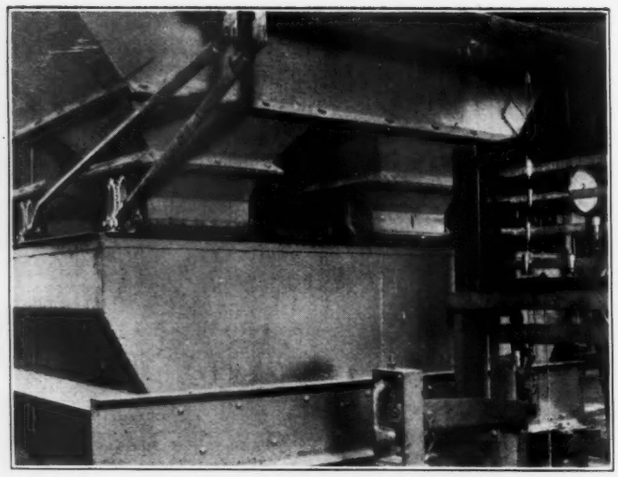
Cement-unloading pump in operation.

height of 53 ft. Two vent pipes add 12 ft. to the height of the cement tank. Both the cement tank and the aggregate head-bin structure were built by the Blaw-Knox Co.

To support the heavy weight of the structures, including their live loads of concrete materials, the eight columns which support them rest on a base of concrete-capped piles. Under the aggregate head-bin structure are driven 30 piles in a nearly-square figure to conform with the shape of the structure above. Each concrete cap is 4 ft. high and 2 ft. 4 in. wide, and its corners project upward 6 ft. 9 in. to afford piers upon which the columns rest. Each pile is calculated to carry a 20-ton load and the cap is made of a 3,000-lb. concrete. Piles in a similar formation support the cement-bin structure.

The Hunt St. yard, of course, was originally and continues to remain a building-material supply yard. For the handling of aggregates a double-track trestle-type bin structure, containing 22 bins, 11 on each side or, rather, 11 beneath each track, was provided. The structure is 145 ft. long and 35 ft. wide, and is built of timber with a roof over the tracks. The bins have self-cleaning bottoms and each one has a capacity of 3 car-loads of material. The two tracks are an extension from the Pennsylvania and the Norfolk & Western Railroad yards which adjoin the plant on the east. Ten cars can be handled on the bin-structure trestle at one time.

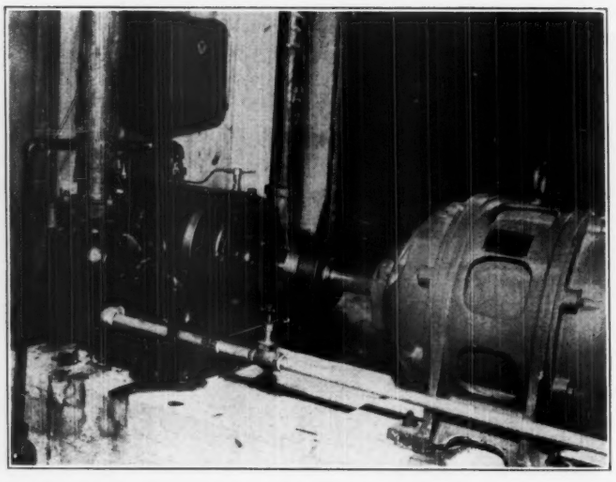
Along the eastern side of the bin structure a belt conveyor reclaims the sand and gravel from the eleven bins for use in the batching plant. This conveyor has a 20-in. belt, 185 ft. long between pulley centers, and is mounted on a steel undercarriage,



The aggregate-weighing batcher. Note 4-compartment clam-shell gates for recombining aggregates in the batcher.

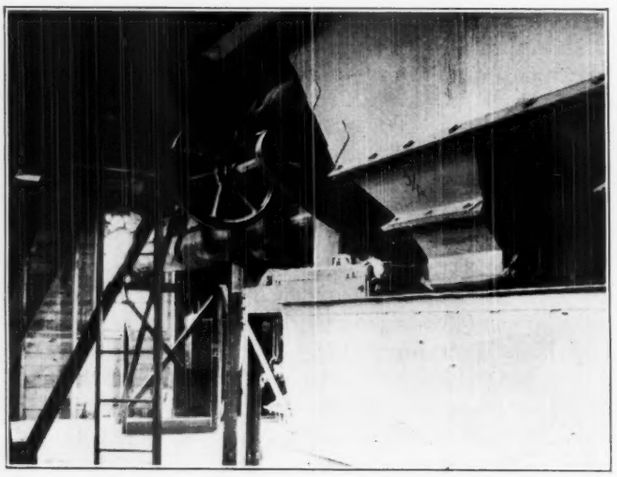
which extends horizontally for access to eight of the bins, then curves upward to deliver material into the boot of the head-bin elevator of the batching plant. Under the present system of handling aggregates, 4 bins contain sand, 2 contain ¾-in. gravel, 2 contain 1-in. gravel, and 3 contain 1½-in. gravel. Each of these bins supplies material to the belt conveyor through gates fitted with direction hoppers. The latter have extended lips and hinged gates (which swing in the direction of the belt travel) to prevent spilling. The entire conveyor structure was built by the Fairfield Engineering Co. and is equipped with Fairfield Life-Time Timken-bearing equipped conveyor idlers and Fairfield 3-pulley-type troughing idlers. It is powered by a 10-hp. Fairbanks-Morse motor.

The elevator, which delivers the aggregates from the conveyor to the batching-plant head-bin, is 76 ft. high between centers and is equipped with 24-in. by 10-in. continuous-type buckets mounted on two strands of steel-bushed roller chains running in T-rail tracks. The elevator, which was also furnished by the Fairfield Engineering Co., is powered by a 30-hp. motor. Both the conveyor and the elevator have a capacity of 150 tons per hr. Discharge from the elevator is made through a swivel spout, which can be directed by a handwheel from the ground level into any of the four compartments of the batching-plant head-bin. The latter stores 400 tons of sand and gravel—one size of concrete sand and three sizes of gravel. It is a Blaw-Knox unit.



Motor driving compressor which supplies air to the cement pump.

In connection with the methods of handling the concrete aggregates, two features are of especial interest: (1) The steam-heating system, and (2) the signal system which aids the movement of aggregates to the head-bin. Each bin in the yard aggregate-bin structure is equipped with two 2½-in. steam pipes which extend around the inside of the bins near the dumping gates. These pipes are erected and trapped in the conventional manner. In the Blaw-Knox batching-plant head-bin, two 2½-in. steam pipes heat the aggregates in all four compartments prior to their use. A pendulum switch in each compartment is connected to an electric horn mounted above the conveyor at the yard aggregate-storage bin. When a compartment is nearly full, the pendulum contacts the switch, causing the horn to sound a warning tone. The operator of the bin-gates then cuts off further flow of material to that compartment.

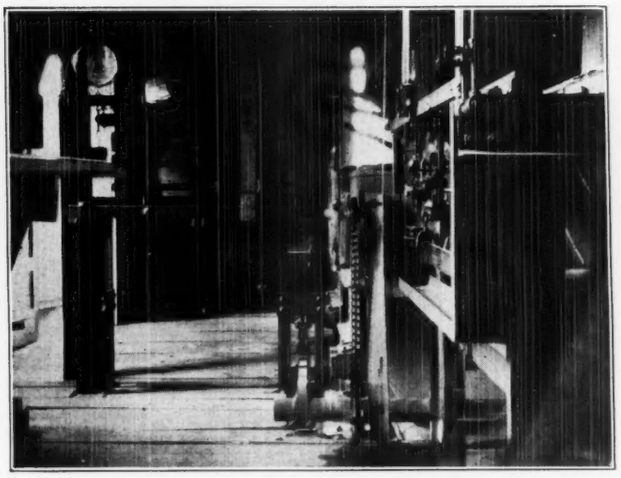


View on the batching floor showing cement screw conveyors and rotary feeders in rear.

Bulk cement is received at the plant in car-load quantities, the cars being received on one of the trestle tracks above the yard bin-structure. A platform adjoining the track provides space for handling and for storing (when not in use) a Fuller-Kinyon self-propelled pneumatic cement-pump. This pump, which affords new conveniences to this former laborious and dusty operation, enables one man to unload a car-load of cement in approximately 3 hr., depending on his experience. Little or no dust is created through this method and the equipment necessary to transport the cement to the batching-plant storage tank is reduced to merely a 4-in. pipe-line. At this plant, compressed air at a pressure of 60 lb. is supplied to the cement-pump by a Fuller-Kinyon rotary-type compressor which is direct-driven by a 50-hp. motor. At the unloading platform, a steel-tank air-receiver is provided to supply air to the cement-pump. Near the position

of the car door is located a junction point for the flexible air- and cement-hose connections to the pump. A moisture trap, mounted at the junction point, traps any moisture in the incoming compressed air. The cement- and air-control valves are near. From the junction point, a 4-in. line extends directly to the Blaw-Knox cement tank at the batching-plant—a distance of approximately 170 ft. The tank has a total capacity of 3 car-loads of cement in two compartments, which allow the use of two grades of cement. An electric signal-system is also provided to indicate to the operator when a compartment in the tank is filled.

Inspecting next the batching equipment, which includes the aggregate, cement- and water-measuring apparatus, we come upon the most important of the operations. Needless to say, some of the most important advances in plant design are to be found here. The Blaw-Knox aggregate-batcher provides for the recombining of aggregates. With four kinds of aggregates stored in the four com-



Scale apparatus on the batching floor: for cement, at right; for aggregates, at left.

partments of the batching-plant head-bin, each compartment has its own clamshell-type dumping gate over the weighing-batcher. Thus, the operator has full control over the exact quantity of sand and the three sizes of gravel, enabling him to exercise a perfect regulation over the gradation of aggregates required for a concrete mix.

The batching hopper, which has a capacity of 4 cu.yd., is equipped with a Howe 4-beam scale capable of weighing a total 35,000 lb. This scale has the familiar tell-tale dial to warn the operator of the approach to the desired weight.

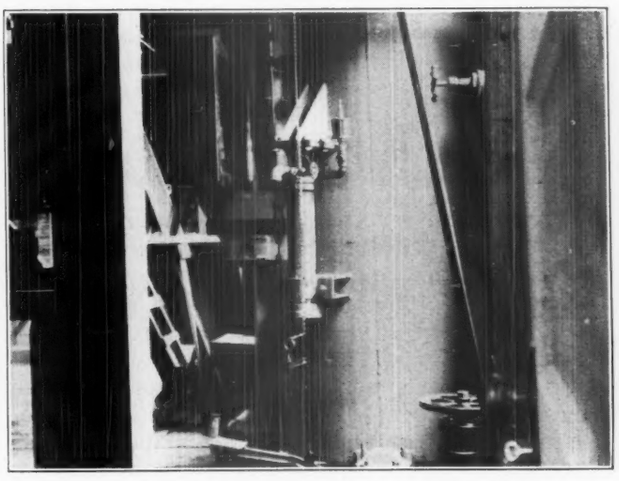
Adjacent to the aggregate-weighing batcher is located the cement-weighing batcher, so the material discharge from both batches enters the truck mixer beneath through a common spout. Cement is transported from the storage tank to the weighing batcher by means of two 14-in. screw conveyors. Cement is received from the tank compartments by two Sprout-Waldron rotary feeders which carry it to the two screws which, in turn, discharge directly to the Blaw-Knox cement-weighing batcher. Cement is handled at the rate of 60 tons per hr.

One of the loaded trucks ready to leave the plant.

through this method, the flow being controlled by the feeder-and-screw mechanism. Each mechanism is driven by a 7½-hp. Fairbanks-Morse motor under control of a push-button or the photoëlectric cell already mentioned. The weighing batcher has a single-beam scale with a recheck beam. When the beam ascends to the middle position, indicating that the correct weight has been reached, the beam pointer cuts the path of light to the photoëlectric cell. Instantly, a relay system cuts off the power to the cement feeder-and-screw motor. After a batch of cement and aggregates has been weighed, the plant operator no longer controls its flow. The truck driver, when his truck is in position to receive its charge, trips a lever which releases the batch through a flexible spout into the truck-mixer body.

Water is measured by means of a Blaw-Knox calibrated 250-gal. tank in volumetric measure. For checking the calibrated gauge-glass, a beam scale, calibrated in gallons or in pounds, is provided. This apparatus has a rapid-filling supply valve as well as a rapid-discharge valve to the truck-mixer tanks.

In connection with the batching of the concrete materials it will be noticed that the operator receives his orders from the yard office over a Tel-



Water tank with device for rechecking weight of mixing water.

autograph system, which insures accuracy and provides a permanent record of the instructions given him. When an order is received, it is immediately converted into its component weights and sent to the plant operator via the Telautograph.

Tables—in fact, a complete book of them—have been worked out for the convenience of the plant men to eliminate the necessity for computing aggregate, cement and water weights for various concrete specifications. The yield of the materials has been computed for any type mix, such as 1:2:4, etc., for any strength, or for any degree of slump. Correction factors are inserted to allow the adjustment of the water volume per batch according to the moisture condition of the aggregates at the time of the batching. When an order is received for a 2,800-lb. concrete at a 6-in. slump, the dispatcher refers to the table for the aggregate and cement weights, makes a correction of the water volume to compensate for the moisture in the aggregate, and the order with its component weights is sent to the plant operator over the Telautograph. The tables, which are the work of J. J. Warner, general manager of the company, are a distinct contribution to the ready-mixed-concrete industry. Unfortunately, because of the variation in specific gravity of the aggregates for different parts of the country, the tables are of use only where aggregates of similar physical characteristics are available.

DAILY REPORT OF DELIVERIES

TRUCK No._____ DRIVER_____

CUSTOMER OR DESCRIPTION OF WORK	OUT	IN	LOAD

GALS. GAS_____ QTS. OIL_____ MILES_____

THIS SPACE FOR GENERAL OFFICE USE ONLY

CHARGEABLE RUNNING TIME _____ HRS.
CHARGEABLE LOADING TIME _____ HRS.
NON-CHARGEABLE TIME _____ HRS
TOTAL TIME ACC'T'D FOR BY THIS YARD _____ HRS

CHARGE TO B. M._____ HRS.

Blank for making report of deliveries. Ten of these are assembled on a large ledger sheet for book-keeping convenience.

The mixing and delivery of the concrete are accomplished by a fleet of Jaeger Truck-Transit Mixers mounted on LeBlond-Schacht 7½-ton trucks. In the fleet are 15 Jaeger 2½-cu. yd. mixers and 2 Jaeger 1½-cu. yd. mixers. Each mixer carries a water tank which receives the correct quantity of water for the batch of concrete in one compartment, and in another compartment sufficient water for rinsing the mixer body on its return trip. Batchmeters to indicate the completion of the mixing time are standard equipment on each mixer.

Remembering that the trucks are hampered somewhat by the limited yard space and the necessity for complete turning through a circle and exit through the limited passageway, it is quite creditable that an average time of but 4 min. is taken in checking in, loading, and checking out. At this speed, 15 trucks are loaded in an hour or 150 trucks in a 10-hr. day. The plant capacity then becomes 375 cu. yd. per day. It is expected that the 4-min. time will be cut to 3 min. through experience and better routing, which will increase the delivery capacity 25 per cent.

An accurate account is kept for each of the trucks. On a large sheet, kept at the Hunt St. office, each of the trucks is accounted for daily, every trip is noted, the time lost and the reasons for it, the mileage made, the gasoline and oil consumption, repair costs, etc. The records from this sheet are transferred to a monthly record, and this, in turn, to a yearly record. It is possible at any time to know the exact cost of operation of each truck per mile, per week, per month, and the like; the service records of tires, gasoline cost, and other important items are known at all times.

The boiler plant, which furnishes steam to heat the aggregates and water during the winter, has not yet been erected. Plans call for a Stanwood 100-hp. boiler to be automatically fired by a stoker. A Sims BH steam-coil storage-tank heater will supply the hot water.

In addition to the company's own laboratory control over the aggregates, moisture, etc., the H. C. Nutting Co. acts as consultant on special problems and handles all strength testing.

Merger Lowers Operating Costs

(Continued from page 48)

Belt sand-settling tanks. From 15 to 20 car-loads of concrete or masons' sand is produced daily and is loaded directly into cars beneath the banks. At the discharge point of the settling tanks a spreader has been attached to load the cars evenly. The spreader consists of a wooden box fitted with a spout, the box being rotatable to spout the sand in any direction.

The Design of Kilns for the Efficient Production of Fused Cement*

By Dipl.-Ing. E. SCHIRM

TRANSLATOR'S NOTE—Comparatively little has been published in English concerning either the properties or the process of manufacture of the high-alumina fused cement which first assumed commercial importance in France as *ciment fondu*. The problems connected with this product are partly economic—bauxite supply, and cost of the finished product—and partly technical. This article will be found to be a good summary of the most important problem connected with the technology of fused cement—the design of the kilns for the actual smelting or fusing.

THE rapid hardening, high-alumina fused cement, which was first produced on a large scale in France during the war, could formerly be introduced in Germany, only in a limited way. For this, there are various reasons. First of all the problem of raw material has not yet been satisfactorily solved. Fused cement contains, as is known, around 50 per cent. Al_2O_3, which is added to the raw mix in the form of bauxite. But suitable bauxite has not yet been found in Germany, and must be imported from France or southern Europe, and in this way the product is handicapped from the start by high transportation costs. The preparation of the raw material, on the other hand, is comparatively simple, as in contrast to Portland cement only a moderate grinding is required. But the actual fusing process has up to the present offered further great difficulties.

The best known smelting or fusing kiln is the shaft or vertical kiln. Its utilization for the production of fused cement was therefore obvious; it has also been introduced in the form of a water-jacketed shaft kiln. For the judgment of kilns it is principally necessary to learn the properties of the raw material in the fusing process. The raw material, essentially bauxite and lime, is fed in a moderately pulverized form into the kiln. After the preliminary heating, the calcining takes place, exactly as in the case of Portland cement. But while the latter thereafter is heated only to the point of sintering, the alumina cement is converted into the fluid state. The fusing temperature in this process lies far lower than that of either of the two essential constituents of the raw material, even lower than the sintering temperature of Portland cement. In the fusing process, the lime and the bauxite to a certain extent dissolve each other. In doing this, they do not by any means remain solid up to the moment of solution or fusing, but instead the dissolving action of the one material on the other sets in much earlier. This has as a consequence, that in contrast to the smelting process in the case of metals, cement exhibits a comparatively broad zone of softening. In this zone the cement is neither fluid nor solid, but "doughy" or pasty. This peculiarity of cement is the most notable and the most troublesome in the whole fusing process. It is the basis for the great difficulties in the kiln which the production of fused cement shows. The pasty state makes the material impervious to the passage of gas through it, and all pores are choked up; furthermore, the cement in this state is not yet fluid enough for the gas to rise through it because of lower specific gravity as otherwise in the case of fluids. The result of this is the persistent choking of the kiln shaft. It is thus necessary continually to poke the gas-impervious layer from the mouth of the shaft by means of rods, a task which by no means simplifies the operation. Continual attendance of the kiln is thus of course required.

Furthermore, the material adheres strongly to the kiln shell, and in a short time decomposes masonry walls. For this reason, masonry has been abandoned entirely immediately around the actual smelting zone and the shaft provided at this part with a water-cooled iron shell, which in operation becomes covered with a thin layer of hardened cake. In this way it is possible at least to eliminate the continual work of putting the kiln in order. On the other hand, the heat losses in this type of construction are of course considerable, which is of especial consequence when electrical firing is chosen. Electrical firing, however, is fundamentally particularly appropriate, because in that case the forcing of large quantities of gas through the pasty layer is eliminated. Avoidance of the chokings caused by this layer is then only necessary so far as must be provided for the regular progression of the material into the fusing zone. The electrically fired water-jacketed shaft kiln has, in fact, succeeded in being introduced in the fused cement industry.

Nevertheless, it presents by no means a satisfactory solution of the kiln problem, as the current costs are almost always too high to make electrical firing economically justifiable. For a long time, therefore, we have been seeking to discover kiln types which make possible the burning of the customary fuels. In these experiments we must note particularly shaft kilns of special design. Fig. 1 shows an example of such an experiment. To the shaft kiln, which serves only for the pre-heating and the calcining, has been joined a hearth furnace. A gas flame sweeps over the fluid fused material that accumulates in the hearth and holds this at the required temperature; when a sufficient quantity of the fusing material has accumulated it is drawn off. The kiln shaft is filled to the top with material, which moves down freely into the fusing zone. The waste gases of the fusing space penetrate the descending material and rise through the shaft to

* Translated from *Zement* 20:118-123. Feb. 5, 1931.

the flue. As the material in the shaft offers a considerable resistance to the gases that pass through it, either high pressure must be maintained in the fusing space, or, since at high temperatures it is hard to keep the arc tight, a suction fan must be installed beyond the shaft kiln. But even under these conditions the kiln suffers from a serious disadvantage. The smelting chamber contains only the material that is already fluid. But the material enters the pasty state at the transition from the shaft to the hearth furnace, that is, where it freely descends. The drawback of choking thus is not eliminated in this kiln; on the contrary, it is necessary to loosen up the material continually through an opening left in the kiln walls at the transition section, and thus continuous attendance of the installation again becomes necessary. Furthermore, as the material can not be loosened up by hand in a uniform manner, the resistance the material presents to the gases varies continually during the operation; that is, sometimes large quantities of excess air reach the fusing chamber, and at other times the kiln is so choked against the penetration of gas that the flames from the fusing chamber burst out in the open and greatly endanger the workers employed at the kiln. An emergency outlet for the flaming gases, therefore, had to be provided in the walls of the fusing chamber. No one will expect the consumption of fuel in this operation to be low.

The difficulties in connection with this kiln lie plainly in the fact that the pasty state of the material is not adequately controlled. Attempts have already been made to separate this zone entirely from the kiln operation. A shaft kiln of this kind is shown in Fig. 2. The fusing chamber is located

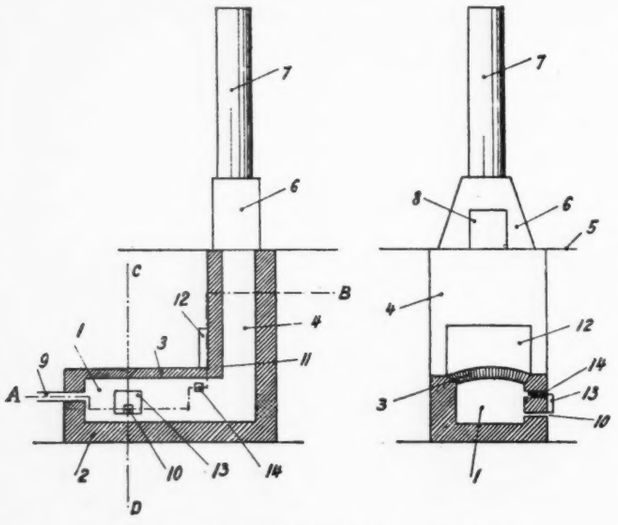


Fig. 1. Combined shaft and hearth kiln.

in the middle. In this case also the material, which issues from the two shafts at either side, moves freely down to the fusing zone. The gases from the fusing chamber, however, do not pass immediately into the shaft, that is, to the place where the doughy state is formed, but rather draw at first upwards and enter the shaft through side openings left in the shaft (see *9* in the drawing). The gases give up the greater part of their heat to the molten mass forming below, and thus reach the openings *9* in a somewhat cooled condition. Whether the cooling is sufficient to prevent the formation of a pasty layer at the entrance of the gases into the shaft, seems very doubtful. Instead, the gases will probably enter the shaft at a temperature only a little below the temperature immediately above the fusing material. It would have been better if the waste gases from the fusing chamber had been further cooled before entrance into the shaft, as has pre-

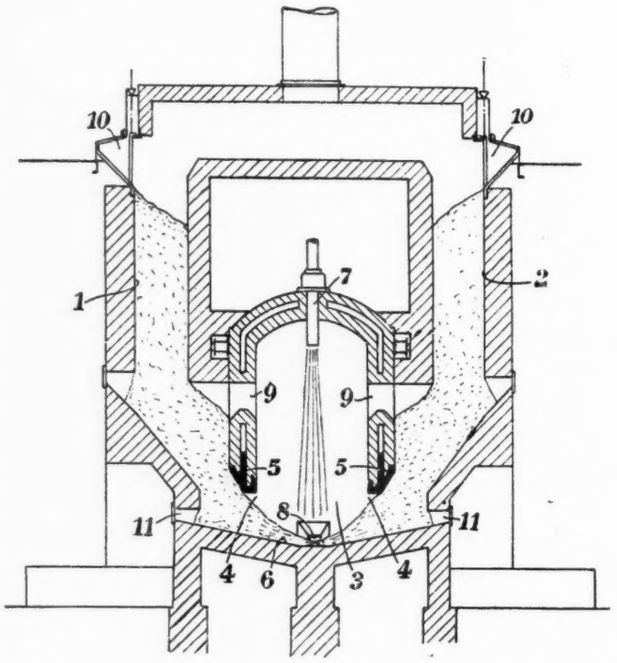


Fig. 2. Shaft-hearth kiln in which the doughy zone is by-passed.

viously been done in other furnaces. This could be done, for instance, by introducing cold air along with the kiln gases at *9*. Also, the construction of a recuperator above the fusing zone for the air of combustion would be conceivable. Then we would at least have the assurance that only sufficiently cooled gases reach the shaft kiln, and choking in the shaft would be precluded. The pasty zone would then be formed only in the stream of material in immediate proximity to the fusing space. There, however, it can be endured, since at this place no gases enter the material. Only the movement of the charge into the fusing zone is somewhat interfered with in this way. In the kiln represented by Fig. 2, therefore, stoker openings for assistance when required have been provided at *11*. A mechanical, continually operating pushing device in this place would considerably lessen the continual attendance of the kiln.

Attempts have also been made in other ways to control the pasty zone in the shaft kiln. Such an effort is shown in Fig. 3. This is a return to the well known multiple-stage shaft kiln, in which the pre-heating and calcining are accomplished in the

upper shaft. From there the material is delivered over the incline *10* to the lower shaft kiln *2*, which terminates below at a refractory grate *6*. Under the grate is the smelting hearth. The firing is done by a flame directed onto the bath of molten material, rising through the grate into the shaft *2* and from

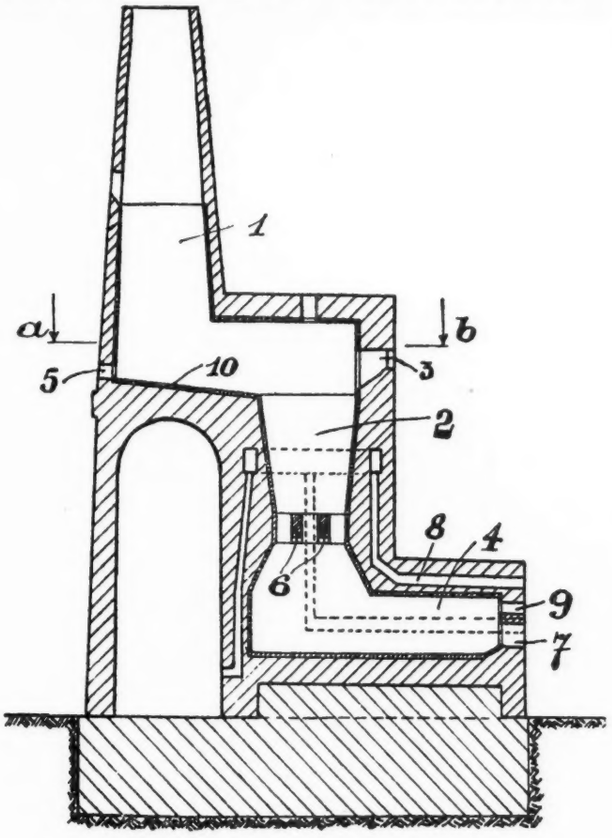


Fig. 3. Shaft-hearth kiln in multi-stage construction.

there into the pre-heating shaft. In addition an opening is provided at *3*, through which additional fuel is introduced. At *5* is located a pushing device which continually advances the material into the lower shaft. The operation is so conceived, that the pre-heating and a part of the calcining take place in the upper shaft, and exclusively by means of the gases from the lower furnaces. In the lower shaft the driving off of the carbon dioxide is completed and then the material is heated to the fusing temperature. To obtain the hot flames needed for this purpose additional hot air is introduced in this part of the shaft. The grate *6* is spaced comparatively wide, so that the softening material can fall through in fairly large lumps. In the fusing furnace below a reducing flame is maintained, so that the iron contained in the raw material separates out. At the same time the hearth space serves somewhat to complete the melting of the material falling through the grate. The critical point in this kiln is without doubt the grate. It is true that a rapid burning out and solution with the molten fluid can be checked by cooling of the grate bars; nevertheless, interferences with the operation of the grate must for this very reason be difficult to avoid. It must still be noted, that the pasty zone is formed above the grate. The chokings that perpetually occur must be continually broken up from above. The comparatively easy accessibility of the softening zone is therefore almost the only improvement in this kiln over the simple shaft kiln.

In addition to the shaft kiln, we have also adopted for the production of fused cement the rotary kiln, with which such good results have been obtained in the manufacture of Portland cement. Even in the case of Portland cement, the rotary kiln encountered the disadvantage that deposits on the kiln shell are formed at the boundary between the decarbonating zone and the sintering zone, and these deposits obstruct the movement of the material through the kiln and occasionally narrow down the kiln so much that operation becomes impossible. The difficulties in the production of fused cement are incomparably greater. The formation of rings at the upper end of the fusing zone is a continual occurrence, and indeed to such a great extent that the kiln at this point completely closes up unless

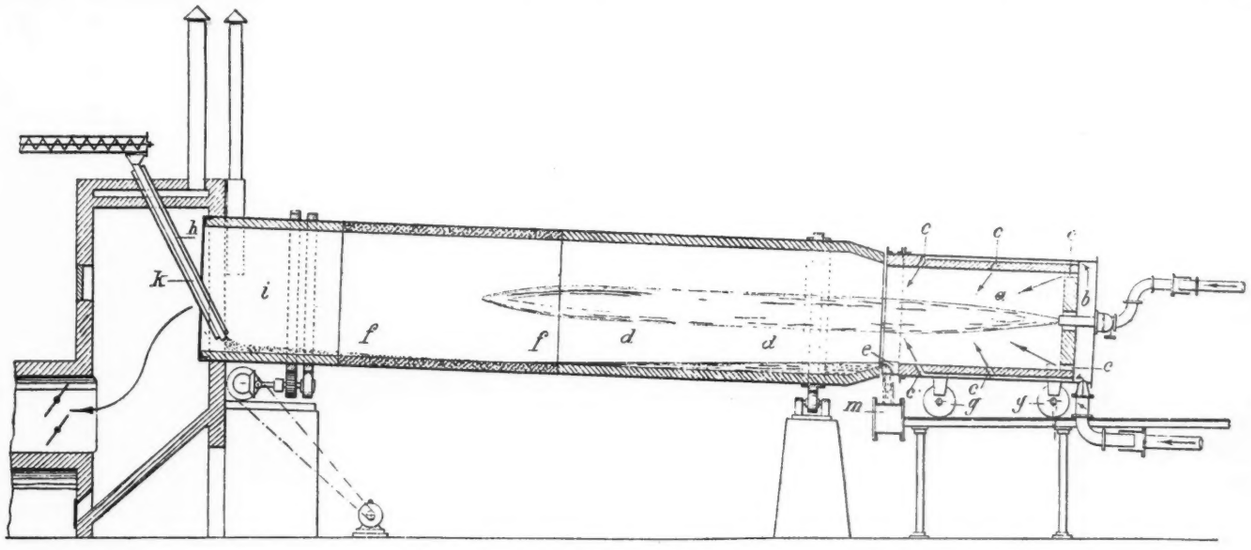


Fig. 4. Rotary kiln for producing fused cement.

one frequently removes the doughy deposits by mechanical means, which is certainly no pleasant task and is attended by great heat losses, if the operation is not completely stopped for this purpose. Frequently it is possible to help this situation by directing the flame against the deposits and melting them away. A really continuous operation, however, can not be maintained in this way. In particular, the smelting zone in the customary rotary kiln is sometimes empty, and sometimes overruns, so that the material is not uniformly fused to completion.

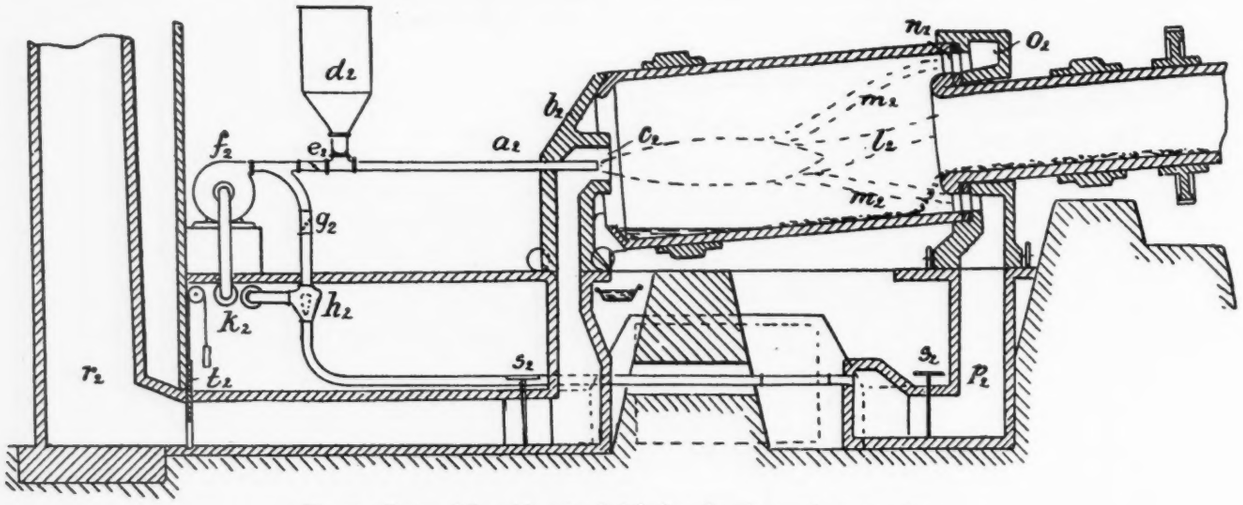


Fig. 5. Rotary kiln with extended fusing chamber and regenerator.

Still another disadvantage was met with in the rotary kiln in its customary construction. The hottest point of the pulverized coal flame is only formed several meters from the mouth of the burner nozzle, that is, from the end of the kiln. Since the cold air of combustion enters at the end of the kiln at the same time, the molten material chills here and chokes the kiln exit. Therefore attempts have already been made in America to produce a short hot flame, and these efforts have been successful to a certain extent by mixing oil with the pulverized coal. The discharge end of the kiln then is hotter; also, the deposits on the upper end of the smelting zone can be more easily melted away, as this point occurs closer to the end of the kiln. This is not a satisfactory solution, however, first because the fuel costs are raised by the more expensive oil, and furthermore because the remaining difficulties, although diminished, are not completely cleared away.

The kiln which is shown in Fig. 4, developed in France, brought a further improvement. In front of the lower end of the rotary kiln was placed a flame-developing chamber in the form of the kiln hood corresponding to it, so that the hottest part of the flame lay at the discharge end of the kiln. The chilling of the molten material could thus be avoided, if one took care that cold air did not enter in appreciable quantities through the discharge opening for the fused cement. The attempt to prevent the formation of rings at the upper end of the fusing zone was made by providing the decarbonating zone, or at least the lower part of it up to and including the softening zone, with a good heat-dissipating lining. The material thus was cooled at this point and could not go over to the doughy state. But when it moved on, it reached a zone of considerably higher temperature, where it immediately melted. The heat losses through the cooled section in this kiln are of course high, if one wishes to obtain a satisfactory capacity. In case the layer of material at the end of the decarbonating zone is shallow enough that the entire charge can be cooled to sufficient depth, it can undoubtedly be assumed that the troublesome formation of rings is prevented. No utilization of the waste heat from the molten material has been provided in this kiln, since

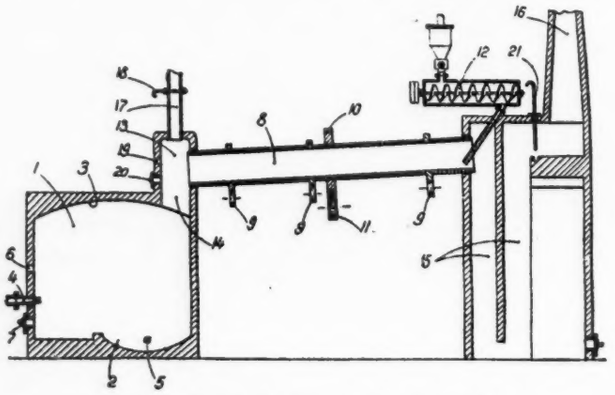


Fig. 6. Combined rotary and hearth kiln.

the cooling process is not yet sufficiently controlled. The molten material is allowed to run freely out of the kiln onto an iron conveyor belt, where it cools and is carried away.

The same idea, to maintain a moderate temperature at the end of the decarbonating zone and a considerably higher temperature in the fusing zone, lies at the basis of, among others, the kiln built according to Fig. 5. As is known, the fused material must have a high temperature, because the iron contained in the raw materials separates out in metallic form, and in case it occurs in fairly large amounts,

as it frequently does, accumulates in the lower part of the molten mass. If the temperature is not high enough, the iron would cake on the kiln walls. To obtain the hottest possible flame, therefore, heated air is introduced into the fusing section in an air preheater, preferably a regenerator. A part of the gases from the fusing section is utilized for heating this regenerator. The remainder enters the rotary kiln, located before the fusing kiln for preliminary treatment of the charge. In order that the iron may be sure to separate out, reducing flame is maintained in the fusing section. But in order to prevent heat losses because of unburned fuel in the waste gases, sufficient quantities of air must be provided at the end of the fusing zone for the complete combustion of the fuel. The best operation therefore is such that the flame in the smelting zone contains excess fuel at its circumference. This is achieved by introducing the air of combustion in the middle of the burner nozzle and the fuel in a ring around it. Then at the end of the flame a sufficiently complete mixing of fuel and air takes place, so that the combustion is completed here.

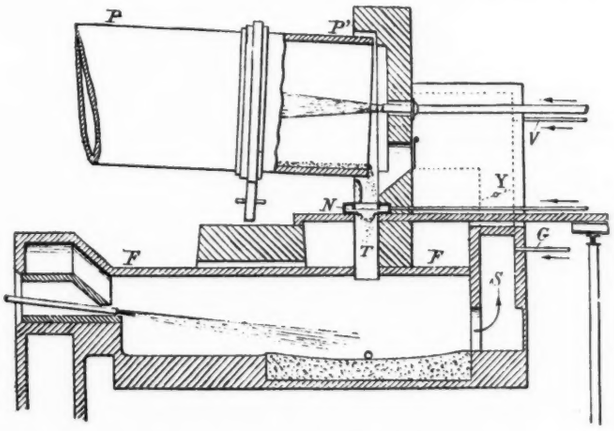


Fig. 7. Combined rotary and hearth kiln with separate gas passage.

As only a comparatively small part of the gases from the fusing chamber reaches the preliminary kiln, the temperature in the latter will be considerably lower than in the fusing space. Whether it is low enough to prevent the material from becoming pasty at this place is questionable, especially as the end of the decarbonating kiln is exposed to the radiant heat of the fusing section. Here are plainly seen what difficulties raw materials high in iron content present. Still further difficulties connected with it will be examined more closely later on.

In the installation, according to Fig. 5, one sees already the effort to separate the fusing chamber from the remainder of the kiln, in order better to control the two different processes of decarbonating and fusing. This idea reaches still clearer expression in the combined rotary and hearth kilns, an example of which is shown in Fig. 6. The heating and calcining there take place in the rotary kiln. Then the material falls through a short shaft into the fusing chamber, a stationary hearth furnace, where the material is heated by a burner flame playing over it. To prevent the premature softening of the material in the rotary kiln and the difficulties connected therewith, in this kiln also only a part of the hearth furnace flame is conducted into the rotary kiln; the remainder enters a recuperator and serves for the pre-heating of the air of combustion. In addition, an opening *20* is provided in the connecting shaft between the hearth and the rotary kiln. From here it is possible to break loose the occasional deposits in the rotary kiln and also to introduce fresh air to lower the temperature of the gases from the hearth furnace. This is a distinguishing characteristic of the installation, since by this means the gas temperature in the rotary kiln can easily be reduced to the desired degree. Even though the rotary kiln is heated with the waste gases from the hearth kiln, the temperature in both kilns can be regulated at will.

A further step in this direction is taken by the installation represented by Fig. 7. This, like that of Fig. 6, is a French construction. The French have in their bauxite a raw material low in iron, which makes it possible to work with moderately high temperatures in the fusing zone, so that the difficulties are considerably smaller. Here again a hearth furnace is located following a rotary kiln for preliminary burning of the material. Both kilns are equipped with only one burner each. Furthermore, the waste gases of the hearth furnace flow into the rotary kiln. The quantity of gas for firing the hearth furnace is thus considerably smaller. This is also made possible by the fact that the temperature usually is not especially high. A damper

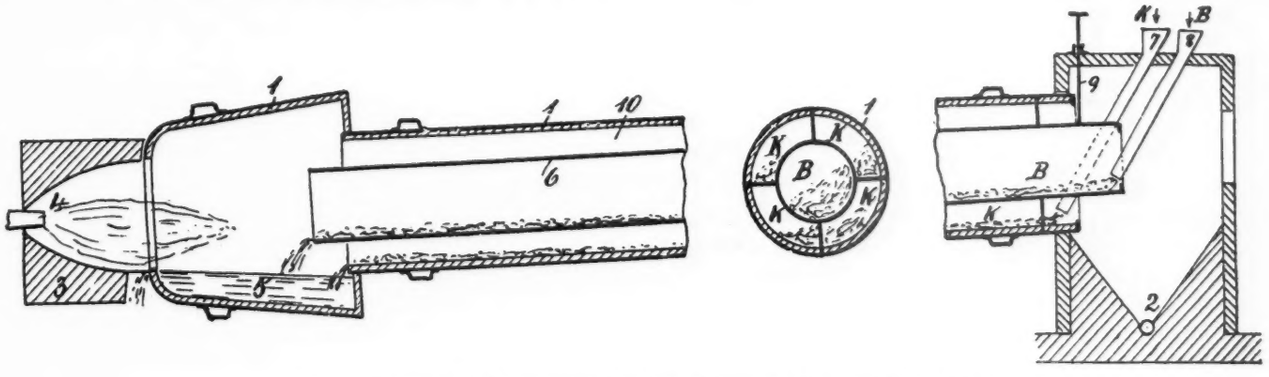


Fig. 8. Rotary kiln for separate burning of bauxite, (B), and lime, (K).

Y is built into the connecting passage *S* between the hearth and the rotary kiln in order to hold back the flame in the hearth furnace and to keep this furnace, in spite of the small quantity of firing gas, always well filled. In addition, a cold air jet is provided at *V* for regulation of the temperature. A special passage *T* is built for the movement of material from the rotary to the hearth kiln, and this passage is locked off at *N* by means of a ring-shaped compressed-air tube. The material can fall freely through the passage, but the hot gases are held back. In this way the unregulated entrance of hot hearth gases into the rotary kiln and the danger of softening of the material in the rotary kiln are checked. The quantity of air that escapes through the ring-shaped slot is slight and therefore to be disregarded. The control of the temperatures in the preliminary and the fusing kilns is comparatively good even here. In particular, the separate passages for the material and for the gas especially alleviate the problem. It is only to be regretted that the choice of the rotary kiln means an unnecessary expense for the preliminary burning. Rotary kilns are expensive, the transference of heat to the material is not particularly good, the temperature of the discharged gases is high, and the fuel consumption high accordingly. The only advantage of the rotary kiln, the uniform absorption of heat throughout the charge, is of no significance in the case of the preliminary burning. One should therefore use the rotary kiln only where one must place value on the last-named advantage. For the initial burning, for example, shaft kilns, more favorable thermotechnically and cheaper, would be adequate.

Another type of kiln differing fundamentally from those already discussed has been proposed. This, to be sure, has not yet been tried, so far as I know, although it is promising in prospect. This is probably because the proposal originates from Germany, where, as already indicated, there are at the present time only slight economic prospects for the manufacture of fused cement. This kiln is that proposed by Moyat, in which the two raw materials, lime and bauxite, are heated apart from one another. The heating takes place up to and over the melting point of the mixture, but remains below the melting point of the individual constituents. This condition is comparatively easy to fulfill, as the melting point of the individual constituents lies well above the melting point of the mixture. After the heating, the two materials are carried into the common fusing chamber, where the fusing proceeds smoothly. Only slight quantities of heat have to be introduced in the fusing kiln—just enough in fact to compensate for the heat losses through the walls of the fusing chamber.

The separate heating can for example take place in two adjacent rotary kilns, the lower ends of which project into a common fusing chamber. A somewhat different construction is represented by Fig. 8. The preheating is accomplished in a rotary kiln consisting of two tubes with a common axis. The inner tube, built entirely of refractory material, is joined with the outer tube by means of radial partition walls. In this way the outer tube is divided into cells, which facilitates the transference of heat to the material. At the upper end of the kiln are installed two feeding spouts for the two raw materials, one to the inner and one to the outer tube. The heating is done by means of a common burner flame projecting into the fusing chamber. In order to be able to distribute the amounts of gas to the inner and to the outer tube at will, two dampers are built in at the upper end of the kiln to throttle the gases in the outer tube.

While in the case of the two adjacent rotary kilns and a common hearth smelting furnace the mixing of the two constituents causes some difficulties, nothing in this respect is to be dreaded in the kiln represented by Fig. 8. The two materials enter the fusing chamber one close after the other; in addition, the fusing chamber itself is made in the form of a rotary kiln, so that its entire charge is continually intermixed. The weakness of the kiln is to be seen in the internal parts of the heating kiln; long life cannot be expected. Here again it would probably have been better, from the standpoint of more favorable fuel consumption, to use shaft kilns instead of the rotary kiln, as no difficulties should be anticipated in the separate heating of the raw materials in the shaft kiln.

A great extravagance always arises in the production of fused cement in the fact that we do not utilize the heat contained in the molten material. For this reason alone a considerably higher fuel requirement is needed than in the case of Portland cement manufacture. The solution of this problem certainly is not simple, since in the change to the solid state one must invariably take care for the crushing of the material, as otherwise the later processes are too greatly handicapped. Therefore it would be necessary first to chill the molten material until it reaches the solid state, so that it splits into small pieces, making as much use of the heat liberated thereby; the rest of the cooling could proceed just as in the case of Portland-cement clinker.

Even though a great number of questions, such as for example the economical cooling of the molten mass, remain unsettled, one can still be fairly certain even today that within a few years practicable kilns with acceptable fuel consumption will be available. One essential reason for the slight utilization of fused cement in Germany will then have disappeared.

In spite of this, nothing can be assumed about the prospects of fused cement, as these depend primarily on the costs of the raw materials. One must remember that even today there are Portland cements with initial hardening only slightly below that of fused cement, with which comparable ultimate strengths can be attained. Fused cement, therefore, will only become a serious competitor of Portland cement when its price lies very little above that of Portland.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

E. D. BARNETT
Superintendent
Cowell Portland Cement Co.
Cowell, Cal.

Coming Events

Aug. 13, 1931. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

Aug. 30-Sept. 4, 1931. Buffalo N. Y. Eighty-second meeting, American Chemical Society, Hotel Statler.

Sept. 4, 5, 1931. Fresno, Cal. Regular meeting, California Associated Concrete Pipe Manufacturers, Hotel Fresno. A. A. Clark, secretary, Box 368, Visalia, Cal.

Sept. 6-12, 1931. Zurich, Switzerland. First International Congress, International Assn. for the Testing of Materials, Swiss Federal Polytechnicum. American representative, American Society for Testing Materials, C. L. Warwick, Sec., Philadelphia, Pa.

Sept. 28-Oct. 1. 1931. Salt Lake City, Utah. Annual meeting, American Assn. of State Highway Officials.

October 12-16, 1931. Chicago, Ill. National Safety Congress. W. H. Cameron, secretary, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

Jan. 9-15, 1932. Detroit, Mich. Annual Convention and show, American Road Builders Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

Jan. 25-26, 1932. Pittsburgh, Pa. Annual convention, National Ready-Mixed Concrete Assn., Wm. Penn Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

Jan. 27-29, 1932. Pittsburgh, Pa. Annual convention, National Sand & Gravel Assn., Wm. Penn Hotel. V. P. Ahearn, secretary, Munsey Bldg., Washington, D. C.

Feb. 3-4, 1932. Washington, D. C. Annual meeting, Sand-Lime Brick Assn. Ellen Knight, sec., 321 N. Hamilton St., Saginaw, Mich.

Feb. 23-26, 1932. Washington, D. C. Annual convention, American Concrete Institute, Wardman Park Hotel. Harvey Whipple, sec., 2970 West Grand Blvd., Detroit, Mich.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fourteen Years Ago

QUARRYING, stone-processing methods and the manufacture of lime at the operations of the J. R. Bittenger Co. near Hanover, Pa., were described in an article by D. J. Hauer. Stone was carried from the floor of the quarry to the lime plant on the upper ledge by a hoist-railway inclined at the steep angle of 45 deg.

* * *

An editorial pointed out that bank-run gravel was rapidly coming into disfavor and urged sand-and-gravel operators to provide facilities for washing and screening materials if they were to keep pace with the demand.

* * *

Ten Years Ago

THE Consumers Co. of Chicago gained control of 25 per cent. of the sand, gravel and crushed-stone business in the Chicago area through the acquisition of a string of producing plants formerly owned by the Cook County Supply Co. and the Producers Material Co.

* * *

The Fuller-Becker Sand & Gravel Co. of Oxford, Mich., was said to have one of the best and most modern plants in the Wolverine State in an article describing its operations.

* * *

A new plant—the Clear Lake Sand & Gravel Co. of Clear Lake, Ia.—started production with an output of 20 to 30 car-loads per day. The company's officers were E. H. Rich, president; H. D. Keerl, vice-president and general manager; F. W. Rich, treasurer; and R. R. Rogers, secretary.

* * *

"Why Plants Should Not Be Located in Pits" was the title of an article which enumerated the reasons for placing processing equipment some distance from the source of supply.

* * *

New incorporations included the following: Little Piney Sand & Gravel Co., Rolla, Mo.—W. R. Bennett, C. B. E. Denton, and J. A. Clark; Milford Sand & Gravel Co., Milford, Ia.—Lloyd Goodrich, G. F. Sokol, and F. D. Pearce; Central Sand & Gravel Co., Des Moines, Ia.—W. R. Gibson, Harry L. Gross, C. W. Layman, and John H. Gibson.

* * *

Five Years Ago

PORTLAND-CEMENT production for July, 1926, was 17,121,900 bbl., shipments were 18,767,000 bbl. and stocks on hand at the end of the month were 17,254,000 bbl.

* * *

To protect the purity of its product—quartz sand—the Pioneer Silica Products Co. of Pacific, Mo., mined by the underground method. The deposit averaged better than 99 per cent. pure silica with less than one-tenth of one per cent. iron oxide.

* * *

E. E. Evans, president of the Whitehouse Stone Co. of Toledo, O., was conducting a brilliant campaign for the prevention of accidents at his plant. Mr. Evans, a prominent pioneer in the industrial safety movement, was chairman of the quarry section of the National Safety Council at the time.

Colorado Fuel Acquires Monarch Stone Quarries

The Colorado Fuel & Iron Co. has purchased the limestone quarries and crushing plant at Monarch, Colo., from Warren E. Burton. The company will utilize most of the stone produced for fluxing purposes at its Minnequa, Colo., steel works.

Robert Jarrard, who has superintended operations at the plant for several years, will continue in that capacity, it is reported.

New Corporations

MINERAL PRODUCTS CORP., Boise, Idaho. $250,000. Norman B. Adkinson, Thomas J. Davis and George R. Parks. To take over property of Idaho-American Fertilizer Co., Parma, Idaho.

FLORIDA TRAP ROCK PRODUCTS CO., Zephyrhills, Fla. R. I. Meader and J. M. Nolan.

TRAVERTINE QUARRIES, INC., Sarasota, Fla. A. W. Naupold and L. J. Larson.

PRAIRIE SAND & GRAVEL CO., Winona, Minn. $100,000. J. Henry Seekamp, president; Edward P. Whitten, vice-president; George C. Kissling, secretary; Joseph L. Henn, treasurer.

CUSTER SAND & GRAVEL CO., Custer, Wis. 100 sh. at $100.00. J. G. Goetz, O. T. Goss and R. C. McMahon. General sand and gravel business.

ATLMAR SAND & GRAVEL CORP., Fulton, N. Y. 2,000 shares of common stock. G. N. Fanning.

BERNARD READY-MIXED CONCRETE CORP., Washington, D. C. Incorporated in South Washington, Va. $50,000. J. L. Bernard, president.

COLORADO CONCRETE CO., 1020 University Bldg., Denver, Colo. 50 sh. n. p. v. P. H., B. and A. Perlmutter.

BEDFORD HILLS CONCRETE PRODUCTS CORP., Bedford Hills, N. Y. $100,000. W. C. B. Schlesinger, 17 East 42nd St., Manhattan.

MINERALS DEVELOPMENT CORP., Guion, Ark. $50,000. John W. Denton.

Personal Mention

Paul Ballard has been appointed sales manager of the Ohio Quartz Products Co. of Jackson, O. The company manufactures silica brick.

Ralph E. Beegan of Pasadena, Cal., has leased gypsum deposits near Brawley, Cal., and is preparing to mine the material. The Southern Pacific railway has agreed to construct a narrow-gauge railway to the property.

Joseph Henritzi of Spokane, Wash., has acquired an extensive limestone deposit near Tenino, Wash. A quarry and plant are to be put in operation shortly, according to reports.

A. W. Hammond has completed the opening of a crushed-stone quarry near Raymond, Wash. Equipment for the plant is now being installed and production is expected to start about August 15.

J. S. Tritle, vice-president and general manager of the Westinghouse Electric & Manufacturing Co., has announced the following appointments: **T. J. Pace,** assistant to vice-president, in charge of general market planning and research analysis; **M. B. Lambert,** sales manager in charge of the transportation department; **O. F. Stroman,** sales manager in charge of the industrial department; and **R. A. Neal,** sales manager in charge of the central-station department.

Stuart P. Maginnis was elected secretary and treasurer, succeeding E. L. Clarke, resigned, at a meeting of the board of directors of the Keystone Portland Cement Co. at Philadelphia, recently.

A. Lundteigen, vice-president in charge of operations of the Ash Grove Lime & Portland Cement Co., Kansas City, Mo., and Mrs. Lundteigen, have sailed for Denmark where they will sojourn for several weeks.

C. R. Ricker, Spruce Pine, N. C., is planning a kaolin plant on the Wiseman property which is located in Avery County. The deposit is said to be one of the largest ever discovered in the United States. In addition to this, extensive deposits of cyanite in Yancey County have been purchased, according to reports.

Joseph J. Baxter, a teacher in the Concrete, Wash., public schools, has relinquished his pedagogical duties to become assistant purchasing agent for Superior Portland Cement, Inc., at the company's offices at Concrete. Mr. Baxter will act as general aide to **Mrs. Catherine Munks,** purchasing agent, whose work was considerably increased since Superior took over the operation of the plant of the Pacific Coast Cement Co. recently.

W. B. Hall, of Stratton, Neb., has moved his sand-pumping outfit to McCook, where he will operate. **Tom Merrill** will have charge of the work. Mr. Hall will install another pump at Stratton.

Edward W. Finnigan of Peekskill, N. Y., recently purchased the stone quarry of Charles A. Haight, Jr., near there. Mr. Finnigan plans a number of improvements.

J. C. Pearson of the Lehigh Portland Cement Co., Allentown, Penn., has been appointed a member of the A. S. T. M. Joint Committee on Specifications for Concrete and Reinforced Concrete. He succeeds **Ernest Ashton,** formerly vice-president of the Lehigh Portland Cement Co., who has resigned.

E. Terrell, of Seaton, Devon, England, recently completed 50 years association with the Beer Stone Co., Ltd. He entered the company's employment as a junior clerk on June 13, 1881, and rose step by step until he became secretary and manager, while for the past five years he has been managing director and principal proprietor of the firm.

D. O. Paul has been placed in charge of the Cincinnati branch office recently opened in the Union Central Bldg. by the National Lime & Stone Co. of Findlay, O.

M. A. Gleasby has formed the Paramount Lime Products Co. and is engaged in business at 3326 San Fernando Road, Los Angeles, Cal.

W. Guy Frazee.

Johann Mayer, 615 Union Avenue N., Portland, Ore., has recently engaged in the concrete-products business.

G. W. Burgess and associates, of Doyle, Tenn., have recently started producing lime at Erin, Tenn. It is rumored that the property of the old Southern Lime Co. owned by the Commerce-Union Bank interests of Nashville will be taken over by this firm.

Obituary

Thomas Young, 36, of Lorain, O., died July 9 from injuries received from working in the quarries of the Cleveland Stone Co. in South Amherst more than three weeks ago. He had been employed for several years by the Cleveland quarries company.

Edward Goodrich Acheson, internationally known abrasives expert, and the discoverer of Carborundum, and artificial graphite, died of pneumonia last month in New York, at the age of 75. Dr. Acheson was born at Washington, Pa., March 9, 1856. At the time of his death Dr. Acheson was chairman of the board of the Acheson Graphite Corp., the Acheson Oildag Co., Acheson Corp., Goodrich Corp., E. G. Acheson, Ltd., and the Acheson Ink Co.

W. Guy Frazee, 39, vice-president and chief engineer of the Iowa Manufacturing Co., Cedar Rapids, Ia., lost his life July 20 in an automobile crash near Moose Lake, Minn. **J. D. Aldrich,** sales manager for the company at Minneapolis, Mrs. Aldrich and Mrs. Frazee, who were also riding in the car when it crashed head-on with another coming from the opposite direction, were injured. **Howard Hall,** president, and **Kenneth Lindsay,** sales manager of the company, went immediately to Moose Lake by airplane when word of the tragedy reached them and brought the body of Mr. Frazee back to Cedar Rapids. Burial took place in Cedar Memorial cemetery at Cedar Rapids.

Mr. Frazee was well and favorably known throughout the pit and quarry industries. He was a competent engineer, a tireless worker, a loyal friend to the thousands who knew him, and a man who had no other idea in mind but that of achieving success for not only himself and his family, but for his friends and fellow workers of the Iowa Manufacturing Co. Besides Mrs. Frazee he is survived by two children, his mother, a brother and five sisters.

Traffic News and Comment

Recent I. C. C. Decisions

Cement.—In a fourth supplemental report the commission has found on further hearing, in I. C. C. Docket No. 15,806, Lehigh Portland Cement Co., *v.* A. & R. *et al.*, that the Florida intrastate cement rates are unduly prejudicial to complainants and unduly preferential of shippers at Jacksonville, Miami, Tampa, and Pensacola, Fla. In the original report, 132 I. C. C. 427, the commission prescribed a basis for reasonable maximum rates which included the use of arbitraries on interstate traffic in the Florida arbitrary territory. In intrastate traffic the Florida Commission allowed the arbitraries only for shipments moving over certain short and weak lines. Carriers are to remove the undue prejudice not later than Oct. 15. The report was written by Commissioner Eastman. Commenting on the situation, he said, "Whenever we have had occasion to prescribe arbitraries for the Florida peninsula on either class-rate traffic or commodities, our action has been prompted by a showing of transportation conditions and the revenue needs of the carriers serving that section. Such a showing has been made here, and if the arbitraries were to be denied in this proceeding, they could not logically be continued on the classes and other commodities for which they have been approved. We adhere to our findings in the original report that the rates there prescribed on cement between points in Florida and points in other southern states are maximum reasonable rates, and find further that the maintenance of rates on cement from Jacksonville, Miami, Tampa and Pensacola to destinations in Florida on a relatively lower basis, taking into consideration in each instance the portion of the haul which is within the peninsula, than is contemporaneously employed in determining rates on the same commodity, from Birmingham and Leeds, Ala., and Clinchfield, Ga., to destinations in Florida, causes undue prejudice to manufacturers and shippers of cement at those interstate producing points and undue preference of manufacturers and shippers of cement at the Florida cities above named. Complainants also allege that unjust discrimination against interstate commerce in favor of intrastate commerce results from the rate situation discussed in this report, but neither they nor defendants stress this issue and the record does not afford support for a finding of such discrimination. For that reason our finding as to the intrastate rates has been confined to the issue of undue prejudice and preference. Under that finding, if the defendants wish to eliminate the arbitraries on shipments from the Tampa mill, they are at liberty to do so, provided they eliminate them also on shipments from the interstate mills. All should be treated alike."

An order requiring a revision in cement rates between points in Illinois, Iowa and Missouri, not later than Oct. 21, has been entered by the commission. The rates from Linwood, Ia., to destinations in Missouri in Scale III territory on and north of the 'Frisco from St. Louis to Pacific, Mo., thence the M. P. Ry., to Labadie, Mo., and the C. R. I. & P. R. R. to Kansas City, Mo., and to destinations in Missouri on and east of the 'Frisco from St. Louis to Horine, Mo., thence the M. P. to Delta, Mo., and the 'Frisco to Cape Girardeau, Mo., are, and for the future will be, unreasonable to the extent that they exceed or may exceed rates based on Scale II, and to other destinations in the socalled "no-scale" territory in Missouri to the extent that they exceed or may exceed rates based on Scale III. The commission found that the circumstances and conditions surrounding the transportation of cement interstate from Linwood, Ia., and intrastate from LaSalle, Oglesby and Dixon to destinations in Illinois and the Chicago switching district were substantially similar and that the relationship as between the intrastate rates and the interstate rates to points of delivery in the Chicago switching district to which the rates from the Illinois mills was 8 c., was, and for the future would be, unduly preferential of the Illinois cement-producing points and unduly prejudicial to Linwood, to the extent that the rate from Linwood was or might be on a higher or different basis, distance considered, than the rates contemporaneously maintained from the Illinois cement-producing points to the Chicago district. The removal of the undue preference and prejudice may be accomplished by the establishment of a rate from Linwood to the Chicago district which is lower than the scale by the same amount that the rate from LaSalle, Ill., to the Chicago district is under the scale. The scale referred to is that prescribed in I. C. C. Docket No. 12,710, Atlas Portland Cement Co., *v.* C. B. & Q., reported in 81 I. C. C. 1. It was found that the present rates to Wausau, Wis., were unduly preferential to shippers at LaSalle and Oglesby, Ill., Ilasco, Mo., and Mason City, Ia., and unduly prejudicial to shippers at Linwood, and that such undue prejudice and preference might be removed by the establishment of Scale II rates on this traffic, Scale II rates being found to be the maximum reasonable rates from those points to Wausau. It was further found that the present rates to destinations in Missouri on and east of the lines of the St. Louis & Hannibal from Hannibal to Gilmore, and of the Wabash to but not including St. Louis, resulted in undue preference to shippers in Missouri located at Ilasco, Prospect Hill, Alpha and Marquette, and that undue preference and prejudice could and should be removed by establishing rates from Linwood that would bear the same relationship to the rates from Missouri producing points as would obtain if the rates from all these points to St. Louis and points north thereof were based on the Docket No. 12,710 scale, and to destinations south of St. Louis on Scale II, except that, since it was found that the circumstances and conditions surrounding transportation from Linwood to St. Louis were more favorable than those surrounding transportation from Marquette, the undue preference of Marquette and undue prejudice to Linwood should be removed by the establishment of rates from Linwood to St. Louis which should bear the same relationship to the rates from Marquette as would obtain if the rates from Linwood were based on the No. 12,710 scale and from Marquette on Scale II. The commission further found that reasonable maximum rates from Linwood to destinations in Missouri in Scale II, Scale III and in "no-scale" territories west of the lines of the 'Frisco from St. Louis to Horine, of the M. P. to Delta, and the 'Frisco to Cape Girardeau, would be Scale II rates to points in Scale II territory and in Scale III territory on and north of the 'Frisco from St. Louis to Pacific, the M. P. to Labadie and the Rock Island to Kansas City, and Scale III rates to other destinations in Scale III territory and points in the described part of "no-scale" territory, and the establishment of these rates would remove the undue preference to Ilasco, Prospect Hill, Alpha, Marquette and Sugar Creek and undue prejudice to Linwood, which now exists. I. C. C. Dockets No. 21,492, Dewey Portland Cement Co. *v.* A. & E. *et al.;* No. 21,500, Same *v.* A. & W. *et al.;* and No. 21,635; Same *v.* C. B. & Q. *et al.* The following cases grouped therewith were dismissed: No. 21,604, Dewey Portland Cement Co. *v.* A. T. & S. F. *et al.;* No. 21,661; Same *v.* C. R. I. & P. *et al;* No. 21,682; Same *v.* C. M. St. P. & P. *et al.;* and No. 21,977, Same *v.* A. T. & S. F. *et al.*

Examiners' Reports

Cement.—Examiner Morris H. Koenigsburg proposes that the commission find that the rates on cement from the Kansas gas-belt territory and from Dewey, Okla., to destinations on the Texas-New Mexico Ry., and from Ada, Okla., El Paso, Cementville, Longhorn, Eagle Ford and

Harrys, Tex., to points in New Mexico on the above railroad, were, are, and for the future will be, unreasonable and unduly prejudicial to the extent that they exceeded or may exceed the rates in Scale 4, Oklahoma Portland Cement Co. *v.* D. & R. G., 128 I. C. C. 63, and proposes reparation. I. C. C. Dockets No. 23,898, Iola Cement Mills Traffic Assn. *et al. v.* A. T. & S. F. *et al;* No. 23,899, Southwestern Portland Cement Co. *v.* T. & P. *et al.;* No. 23,902, Oklahoma Portland Cement Co. *v.* A. T. & S. F. *et al.;* No. 23,995, San Antonio Portland Cement Co. *v.* I. G. N. *et al.;* and No. 24,133, Republic Portland Cement Co. *v.* G. C. & S. F. *et al.*

Feldspar.—Examiner Carl A. Schlager proposes that the commission find not unreasonable the rate on ground feldspar from Cane Branch, N. C., to Knoxville, Tenn., and that the complaint be dismissed. I. C. C. Docket No. 23,983, Knox Porcelain Corp. *v.* Black Mountain *et al.*

Food in Glass Containers.—While not directly affecting the non-metallic minerals industry, the lime and feldspar businesses are indirectly affected by the investigation and suspension proceedings before the commission in I. & S. Docket No. 3,569, classification ratings on food products, less than car-loads, packed in glass between points in Official and Illinois Classification territories. In Indian Packing Corp. *v.* Director General, 93 I. C. C. 400, the commission prescribed a basis for rates on food in glass containers one numbered class higher than that applicable to the same food in tin. The carriers who were parties to the Official and Illinois classifications filed schedules to become effective last February putting food packed in glass containers on the same basis as the same food packed in tin containers. These schedules were suspended on the motion of the commission itself. The report of the examiners, W. A. Hill and C. G. Jensen, Jr., has just been filed. They propose that the commission find that the suspended schedules are in violation of section 15-A, in that they are not reasonably compensatory, and that they should be cancelled in all cases where there is not a spread of one numbered class in favor of food in tin containers. They contend that the reduced rates would only mean reduced revenue, while the respondent carriers took the position that the reduced rates would enable them to regain enough of the traffic that had gone to motor trucks, and furnish increased tonnage through the increased use of glass containers instead of tin.

New Complaints Filed

Calcined Magnesite.—Rates on calcined magnesite in violation of sec. 1 and 3, from New York and Brooklyn, N. Y., to Memphis, Tenn., compared with rates to Nashville, Tenn., and other points in southern territory are alleged, and new rates and reparation sought in I. C. C. Docket No. 24,521, Memphis Freight Bureau, Loeb Stone Co., Memphis, Tenn. *v.* Pennsylvania *et al.*

Crushed Stone, Sand and Gravel.—The commission has suspended, from July 14 until Feb 14, 1932, schedules in supplement No. 105 to Glenn's I. C. C. No. A-655 which proposed to apply the single-line scale instead of the joint-line scale in making rates on crushed stone, sand, gravel, chert and related articles, which would result in reductions on traffic moving over more than one line between points in the South.

Fourth-Section Relief

Ground Limestone.—Subject to the usual restrictions as to circuity, the carriers, defendants and respondents in I. C. C. Docket No. 23,068, New Castle Lime & Stone Co. *v.* A. & S. *et al.*, in response to Agent Jones' Application No. 14,410, have been authorized to establish and maintain over all routes for the transportation of ground limestone in car-loads from Shaw Junction, Pa., to points in New York, Pennsylvania, Maryland and West Virginia, the lowest rate applicable over any line or route from and to the same points constructed on the basis of the single- and joint-line distance-scales of rates prescribed or approved in the above report in Docket 23,068, and to maintain higher rates from, to and between intermediate points; provided that the rates from to and between said higher-rated intermediate points shall not exceed the rates constructed on the basis of the said distance-scales of rates and shall in no case exceed the lowest combination of rates subject to interstate commerce act. F. S. C. No. 10,646.

Sand and Gravel.—The C. & N. W. and the C. M. St. P. & P., in response to their application No. 14,363, have been authorized until Jan. 1, 1932, to establish and maintain rates for the transportation of sand, gravel, crushed or pulverized stone and strippings from stone quarries and gravel pits, from South Beloit, Ill., to Milwaukee, Wis., and points in Wisconsin grouped therewith, the same as the rates contemporaneously in effect on like traffic from Beloit, Wis., to said destinations and to maintain higher rates to intermediate points; provided that rates to said higher-rated intermediate points shall not be increased except as authorized by the commission and shall in no case exceed the lowest combination of rates subject to the interstate commerce act. F. S. O. No. 10,645.

Fourth-Section Applications

Cement.—F. A. Leland, agent, has requested fourth-section relief in connection with the establishment of rates on cement, car-loads, from St. Louis and E. St. Louis to Dewey, Okla., on traffic originating east of the Indiana-Illinois state line. Appl. No. 14,421.

Ground Limestone.—J. E. Tilford, agent, has requested fourth-section relief in connection with the establishment of rates on ground or pulverized limestone, car-loads, between points in Southern territory. Appl. No. 14,436.

Rate-Committee Dockets

Central Freight Assn.

Sand and Gravel.—Carriers propose to establish on sand and gravel,[1] from Ra Junction, O., to Kn Cabin, O., a rate of 50 c. a net ton. The present rate is 18½ c. per 100 lb. Docket No. 29,052.

Southwestern Freight Bureau

Agricultural Limestone.—To allow the St. L. S. W. to participate in competitive traffic, carriers propose to establish a rate of 85 c. a net ton on agricultural limestone, suitable for land-fertilization purposes only, carload minimum weight as per Item 1,391, S. W. L. Tariff 114-D, from Cape Girardeau and Marquette, Mo., applicable on intrastate traffic only, to Missouri stations on the St. L. S. W., Nilo, Bragg City, Hillsman-Taylor, Deering, Bragadocia, Ferris, Blazer, Hamlin, Morganfield and Caruthersville, Mo., via the 'Frisco. Docket No. 23,305.

Lime.—To clear fourth-section departures, carriers propose to publish a rate of 27½ c. per 100 lb. on lime, car-load description and minimum weight as per Item 2,256, S. W. L. Tariff 8-I, from New Braunfels, Round Rock, McNeil, Tex., and other points shown in that item to stations on the N. I. & N., Arnaudville to Levert, La., inclusive. Docket No. 23,291.

Sulphur.—Carriers propose to publish a rate of $8.30 on crude sulphur and $10.10 a net ton on refined sulphur, description and minimum weight as per S. W. L. Tariff 102-M, from sulphur-producing points in Texas, as shown in Item 65 of the tariff, to Harriman, Tenn.

[1] The carload minimum weight will be 90 per cent. of the marked capacity of the car, except that, when the car is loaded to full capacity or visible capacity, actual weight will apply.

Appoints Representative for Wire-Cloth Products

The Newark Wire Cloth Co., Newark, N. J., announces that it has appointed the Pacific Metals Co., Ltd., of San Francisco as West Coast representatives.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

$1,000,627 Net Reported by International Cement

International Cement Corp. reports for the quarter ended June 30, 1931, net income of $589,718 after depreciation, interest, federal taxes, etc., equivalent to 92 cents a share on 636,124 shares of no-par common stock. This compares with $410,909 or 65 cents a share on 636,085 shares in the preceding quarter and $1,210,-282 or $1.91 a share on 631,356 shares in the June quarter of 1930.

Net income for six months ended June 30, 1931, totaled $1,000,627 after taxes and charges, equal to $1.57 a share on 636,124 shares comparing with $2,051,762 or $3.25 a share on 631,356 shares in first half of 1930.

Income account for the six months ended June 30, 1931, compares as follows:

	1931	1930
Gross sales	$14,980,049	$16,291,409
Expenses, etc.	11,797,527	12,035,628
Depreciation	1,302,825	1,279,945
Balance	$1,879,697	$2,975,836
Interest, taxes, etc.	879,070	924,074
Net income	$1,000,627	$2,051,762

Penn-Dixie Cement Loss for Fiscal Year $115,551

Pennsylvania-Dixie Cement Corp. reports for the 12 months ended June 30, 1931, profit of $627,086 after depreciation and depletion but before interest and federal taxes, comparing with $1,048,817 in the 12 months ended June 30, 1930. After deducting interest and federal taxes there was a net loss of $115,551 against a net profit of $304,553, equivalent to $2.24 a share on 135,888 shares of 7-per cent. preferred stock in the preceding 12 months.

The showing for the year reflects the conditions prevailing during the past eight months which have resulted in steadily declining cement prices which are now at their lowest level in many years.

The balance sheet as of June 30, 1931, shows the ratio of current assets to current liabilities of over 10 to 1. Cash and short-term securities are more than a million dollars greater than a year ago and nearly five times current liabilities. Net current assets of $5,870,784 represent 56 per cent. of outstanding bonds in the hands of the public, which have been reduced $648,000 during the past 12 months.

The consolidated income account for 12 months ended June 30, 1931, compares as follows:

	1931	1930
Gross profit	$2,011,634	$2,439,080
Depr. and depl.	1,384,548	1,390,263
Balance	$627,086	$1,048,817
Interest	646,806	692,465
Federal taxes	95,831	51,799
Net loss	$115,551	*$304,553

*Profit.

The company's consolidated balance sheet as of June 30, 1931, compares as follows:

ASSETS

	1931	1930
*Fixed assets	$23,671,313	$24,859,991
Cash	2,423,124	1,899,218
Notes and accts. rec.	994,672	1,122,070
Short-term sec.	620,000	.....
Inventories	2,469,460	2,992,011
Misc. investments	347,721	405,763
Insurance fund	186,919	138,920
Deferred charges	59,643	20,598
Total	$30,772,852	$31,438,571

LIABILITIES

7% preferred stock	$13,588,800	$13,588,800
†Common stock	4,000,000	4,000,000
Gold bonds	10,487,000	11,135,000
Accounts payable	227,043	242,956
Accruals	305,531	350,022
Federal tax reserve	103,899	95,274
Misc. reserve	104,725	111,567
Surplus	1,955,854	1,914,952
Total	$30,772,852	$31,438,571

*After depreciation and depletion. †Represented by 400,000 no-par shares.

Texas Gulf Sulphur Co. Quarterly Income Drops

Texas Gulf Sulphur Co., Inc., reports for quarter ended June 30, 1931, net income of $1,939,967 after depreciation and federal taxes, but before depletion, equivalent to 76 cents a share on 2,540,000 shares of no-par stock. This compares with $2,448,198, or 96 cents a share in the preceding quarter and $3,648,345, or $1.43 a share in the June quarter of previous year.

During the last quarter the company increased its reserves for depreciation and accrued federal taxes, by $56,832, making the total of these reserves $13,716,716 on June 30, 1931.

Statement for the quarter ended June 30, 1931, compares as follows:

	1931	1930
Net income	$1,939,967	$3,648,345
Dividends	1,905,000	2,540,000
Surplus	$34,967	$1,108,345
Profit and loss surplus	$25,143,810	$23,760,607

Net income for six months ended June 30, 1931, was $4,388,165 before depletion, equal to $1.72 a share against $7,452,046, or $2.93 a share in first half of 1930.

	1931	1930
Net income	$4,388,165	$7,452,046
Dividends	4,445,000	5,080,000
Deficit	$56,835	*$2,372,046

*Surplus.

Arundel Corp. Net Income Nearly Equals Year Ago

For the six months ended June 30, 1931, the Arundel Corp., of Baltimore, Md., reports net income of $1,127,020 after depreciation and taxes, comparing with $1,197,513 in first half of 1930.

June net income after depreciation and taxes was $255,914, against $345,774 in June, 1930. Current assets on June 30 amounted to $4,072,570 and current liabilities to $350,919.

Alpha Earnings Decline in Year Ended June 30

Alpha Portland Cement Co. reports for the 12 months ended June 30, 1931, net income of $546,583 after depreciation and federal taxes, equivalent after 7 per cent. preferred dividend requirements, to 57 cents a share on 711,000 no-par shares of common stock. This compares with $1,408,916 or $1.78 a

CURRENT DIVIDENDS

Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Arundel Corp	Common	$0.75 qr.	June 22	July 1	Kelley Island Lime & Trans.	Common	$0.50 qr.	June 20	July 1
Alpha Portland Cement	Common	$0.25 qr.	July 1	July 25	Lehigh Portland Cement	Preferred	$1.75 qr.	June 13	July 1
Bessemer Limestone & Cement	Class A	$0.50 qr.	July 20	Aug. 1	New York Trap Rock	Preferred	$1.75 qr.	June 20	July 1
Boston Sand & Gravel	Preferred	.....	June 22	July 1	Pacific Portland Cement	Preferred	.....	June 30	July 1
Calaveras Cement	Preferred	$1.75 qr.	June 30	July 15	Pennsylvania Salt	Common	$0.75 qr.	June 30	July 15
Canada Cement Co	Preferred	$1.62½ qr.	May 30	June 30	Riverside Cement	1st Pfd.	$1.50 qr.	July 15	Aug. 1
Canada Dredge and Dock	Common	.....	July 16	Aug. 1	Santa Cruz Portland Cement	Common	$1.00 qr.	June 20	July 1
Canada Dredge and Dock	Preferred	.....	July 16	Aug. 1	Southwestern Portland Cement	Common	.....	June 30	July 1
Consolidated Sand & Gravel	Preferred	$1.75 qr.	.....	Aug. 15	Southwestern Portland Cement	Preferred	.....	June 30	July 1
Dolese & Shepard	Common	$1.00 qr.	June 30	July 1	Standard Paving & Material	Preferred	$1.75 qr.	.....	Aug. 15
Dufferin Paving & Crushed Stone	1st Pfd.	$1.75 qr.	June 19	July 2	Superior Portland Cement	Class A	$0.27½ M	June 23	July 1
General Aggregates	Common	$0.25 qr.	July 1	July 15	Texas Gulf Sulphur	Common	$0.75 qr.	Sept. 1	Sept. 15
Great Lakes Dredge & Dock	Common	$0.25 qr.	Aug 5	Aug. 15	Warner Co	1st Pfd.	$1.75 qr.	June 15	July 1
Ideal Cement	Common	$0.75 qr.	June 15	July 1	Warner Co	2nd Pfd.	$1.75 qr.	June 15	July 1
International Salt	Common	$0.75 qr.	June 15	July 1	Warner Co	Common	$0.25 qr.	June 30	July 15

share in the 12 months ended June 30, 1930.

Consolidated income account for 12 months ended June 30, 1931, compares as follows:

	1931	1930
Net sales	$8,265,389	$10,797,831
Operating expenses	6,339,001	8,150,627
Depreciation	1,385,677	1,317,547
Operating profit	$540,711	$1,329,657
Other income (net)	151,671	248,985
Total income	$692,382	$1,578,642
Federal taxes	145,799	169,726
Net income	$546,583	$1,408,916
Preferred dividends	†105,000	*175,000
Common dividends	1,066,500	1,955,250
Deficit	$624,917	‡$721,334

*Includes five quarterly dividends. †Three quarterly dividends. ‡Surplus.

Earned surplus account follows: Earned surplus July 1, 1930, $3,923,957; add: Net income for 12 months ended June 30, 1931, $546,583; total earned surplus $4,470,540; deduct: Preferred dividends $105,000; common dividends $1,066,500; additional depreciation for year 1928, $32,366; additional federal taxes for prior years $200,000; adjustment of sack inventory to market value at December 31, 1930, $95,658; leaving earned surplus June 30, 1931, $2,971,016.

Consolidated balance sheet of Alpha Portland Cement Co. as of June 30, 1931, compares as follows:

ASSETS

	1931	1930
*Property account	$20,426,268	$21,733,564
Cash	3,143,038	1,924,593
Call loans	.....	.....
U. S. Govt. secur., etc.	3,079,950	3,864,975
Work funds and adv.	130,807	200,467
Accts. and notes rec.	885,812	957,115
Inventories	2,373,128	2,804,679
Misc. investments	290,203	272,829
Deferred charges	178,335	146,027
Total	$30,507,541	$31,904,249

LIABILITIES

Preferred stock	$ 2,000,000	$ 2,000,000
†Common stock	24,134,500	24,134,500
Accounts payable	269,520	436,049
Wages payable	38,920	74,759
Federal tax res., etc.	154,503	211,236
Dividends payable	177,750	390,500
Insur. and other res.	761,332	733,248
Earned surplus	2,971,016	3,923,957
Total	$30,507,541	$31,904,249

*After depreciation, depletion, etc. †Represented by 711,000 no-par shares.

Earns 36 Cents a Share in Year Ending June 30

The report of the Lehigh Portland Cement Co. for the twelve months ended June 30, 1931, shows net profit of $1,631,440 after depreciation, federal taxes, etc. After deduction of 7 per cent. preferred dividends, the balance was $205,487 equal to 46 cents a share (par $50) on 450,348 shares of common stock.

Bessemer Limestone and Cement Lowers Dividend

The Bessemer Limestone & Cement Co. of Cleveland, O., has declared a quarterly dividend of 50 cents on the Class A common stock, payable August 1 to stock of record July 20, placing the stock on a $2 annual basis, against $3 previously.

BUILDING-MATERIAL PRICES, JULY 1, 1931

Data collected by the Bureau of the Census and prepared by the Division of Building and Housing, U. S. Bureau of Standards.

City	Portland Cement (bbl.)	Gypsum Plaster (ton)	Gypsum Plaster Board (1,000 sq. ft.)	Hydrated Lime (ton)	Building Sand (cu. yd.)	Crushed Stone (ton)	Roofing Slate (100 sq. ft.)
Akron, O.	$1.74	$14.00	$36.00	$12.00	$1.85	$2.50	.....
Albany, N. Y.	2.52	17.10	24.75	15.75	1.85	1.85	.....
Atlanta, Ga.	2.20	15.00	35.00	12.50	2.50	2.50	.....
Baltimore, Md.	2.20	15.50	25.00	13.00	2.00	2.50	$10.00
Buffalo, N. Y.	2.95	16.00	18.00	18.00	1.85	2.05	12.00
Chicago, Ill.	2.40	16.00	21.00	17.00	2.00	2.00	.....
Cincinnati, O.	2.14	.....	22.75	14.00	2.63	2.55	.....
Cleveland, O.	1.68	14.50	.....	10.00	1.69	2.15	16.00
Columbia, S. C.	2.40	15.50	35.00	12.50	1.50	2.75	12.00
Columbus, O.	2.35	14.40	35.00	12.00	1.50	2.75	14.00
Denver, Colo.	2.20	18.00	35.00	22.00	1.25	1.45	.....
Des Moines, Iowa	2.00	15.00	25.00	20.00	1.65	3.50	15.00
Erie, Pa.	2.20	16.00	22.50	16.00	2.00	.....	.....
Fairmont, W. Va.	2.80	18.00	35.00	16.00	3.00	3.50	13.00
Grand Forks, N. D.	3.00	20.00	.....	25.00	2.60	.....	.....
Haverhill, Mass.	2.60	18.50	25.00	18.00	.....	.....	.....
Kansas City, Mo.	1.80	15.00	25.00	24.00	1.76	1.88	17.00
Lansing, Mich.	2.25	16.00	.....	.....	2.10	.....	.....
Los Angeles, Cal.	2.30	15.20	23.50	24.50	1.85	1.90	.....
Louisville, Ky.	1.86	17.00	.....	15.50	2.15	2.15	15.00
Milwaukee, Wis.	1.48	15.20	22.00	14.00	1.35	1.35	.....
New Bedford, Mass.	2.80	16.50	24.00	16.50	1.75	2.75	.....
New Haven, Conn.	2.70	.....	.....	19.00	1.25	2.25	.....
New London, Conn.	2.60	18.00	25.00	18.00	1.50	3.00	.....
Paterson, N. J.	2.20	17.50	24.00	18.00	1.50	2.10	12.00
Philadelphia, Pa.	2.16	17.50	.....	14.50	1.75	2.60	11.22
Poughkeepsie, N. Y.	2.50	.....	.....	20.00	2.25	2.20	.....
Richmond, Va.	3.10	20.00	31.00	17.50	1.95	2.45	13.00
Rochester, N. Y.	2.28	16.00	22.00	20.00	1.75	2.40	12.00
Rockford, Ill.	2.60	16.00	25.00	20.00	1.40	1.15	.....
St. Louis, Mo.	1.85	18.00	.....	18.00	1.35	1.00	13.00
St. Paul, Minn.	2.45	18.00	.....	18.00	2.23	1.75	13.00
Saginaw, Mich.	1.61	18.00	24.00	16.50	2.50	2.18	14.40
San Antonio, Tex.	2.43	19.15	40.00	20.00	2.25	1.88	16.50
San Francisco, Cal.	2.40	19.90	.....	22.50	1.40	1.60	16.00
Scranton, Pa.	2.60	19.00	.....	20.00	3.25	.....	.....
Seattle, Wash.	2.50	20.00	.....	22.00	1.40	1.90	.....
Shreveport, La.	3.20	22.00	35.00	.....	2.00	3.80	15.00
Sioux Falls, Ia.	2.40	15.00	.....	24.00	1.25	2.25	.....
Syracuse, N. Y.	2.16	15.00	25.00	13.00	1.80	1.70	13.50
Tampa, Fla.	2.60	20.00	.....	20.00	2.00	4.00	.....
Terre Haute, Ind.	2.25	18.00	28.00	18.00	1.50	3.00	13.25
Trenton, N. J.	1.64	17.50	24.00	18.50	1.65	2.15	12.00
Tucson, Ariz.	3.37	17.70	40.00	30.00	1.25	2.25	.....
Washington, D. C.	1.88	16.00	25.00	13.00	.....	.....	.....
Waterbury, Conn.	2.60	20.00	30.00	20.00	1.25	2.45	15.00
Youngstown, O.	2.95	.....	.....	20.00	3.75	2.50	.....

Ft. Wayne Manufacturer Makes an Announcement

Emil Deister, president of the Deister Machine Co., recently made the following announcement relative to the scope of activities of the company he represents:

"The Deister Machine Co. of Fort Wayne, Ind., has acquired from time to time, since its incorporation in 1912, the exclusive right to the manufacture and sale of all Deister equipment and improvements under Deister patents, for which applications were made subsequent to January 1, 1912, and also other patents, pertaining to ore-concentrating tables, coal-washing tables, coal washers, self-oiling headmotions for same, vibrating screens, classifiers, etc."

Offers Prizes for Ideas on Lowering Plant Costs

In every plant, no matter how well mechanized, there are points where material piles up, unnecessary labor used, machine operations interrupted, where better transportation is needed. The Chain Belt Co. is offering $500 in prizes to those who hunt out these "missing links" and submit the sketches showing how chain-and-belt conveying or other Chain Belt Co. products, including construction machinery, can be applied to lower costs.

No obligation is involved. Articles will be judged on merit—no proposed installation is too small or too large, only it must be in an existing plant.

During 1931, the Chain Belt Co. found that its costs could be reduced, more through the application of modern machinery than by the reduction in cost of materials. This contest is instituted to bring out similar situations in other plants. Following are the contest rules:

(1) The Chain Belt Co. will pay $500 in cash prizes to persons who send in the best articles and sketches for the use of chain and belt conveying or other Chain Belt products in existing plants.

(2) Articles must be on possible new installations or replacements of existing installations and must contain definite data on possible cost reductions, and be accompanied by rough sketch.

(3) The prizes are as follows: 1st prize, $200; 2nd prize, $100; 3rd prize, $50; 15 prizes of $10 each, or a total of 18 prizes totalling $500.

(4) The offer is open to everyone except employees or distributors of the Chain Belt Co. or their families. There is no obligation.

(5) All entries must be received at the offices of the Chain Belt Co., 1600 West Bruce St., Milwaukee, Wis., before 5 p. m. on September 21.

(6) Contestants may submit as many sets of articles and sketches as they wish, provided they cover different proposed installations.

(7) All entries should show name, address, position and firm. Names of contestants or companies will not be published without authorization.

(8) The judges will be appointed by the Chain Belt Co. Their decision will be final. In case of ties, duplicate awards will be made tying contestants.

Review of Foreign Practice

European Lime Plant Is Automatic in Operation

A lime and crushed-stone plant built not long ago by the Société Sarroise Eckart et Hotop G. m. b. H. for a large steel works is particularly interesting in that its operation is almost entirely automatic. It has a daily capacity of 350 tons of calcined lime and 200 tons of stone for road surfacing. Raw stone entering the plant in cars is discharged into storage bins, and later is fed to jaw crushers, the product of which is separated into kiln stone and road stone. The products are conveyed to storage bins, and withdrawn into cars. The kiln stone is hauled to feed hoppers for the kilns, connected by inclined elevators with the mouth of each kiln. An electrically-operated monorail conveyor feeds the kiln fuel from a large storage to hoppers before the kilns, which likewise feed the skips of the inclined elevators.

All four kilns are built of reinforced concrete. One is a separate unit of 60- to 70-ton capacity and the remaining three are units of 100-ton-capacity each, built in a single block. They are so well equipped with automatic-charging and discharging devices that their operation requires the supervision of only one man. The calcining chambers have a practical height of 19 meters (62 ft.) and are connected at the bottom with mechanical grates. The burned lime falls from this grate to a screen which divides it into lump lime and powdered lime; thence it passes to storage bins, from which it is loaded into special cars of 50-ton capacity. Besides the kiln attendant the operation requires one man who supervises the operation of the skip, and a kiln foreman. These three men are able to produce 350 tons of lime daily, and the fuel consumption is 17 to 18 per cent.—*Revue des Materiaux de Construction* No. 261, pp. 252-3, June, 1931.

High-Grade Cement Made in Vertical Shaft Kilns

There is a widespread and unjust tendency (and, according to this author, particularly in Spain) to consider cement made in shaft kilns inferior in strength and quality to cement made in rotary kilns, as though it were an intrinsic function of the different processes. Undoubtedly better cement is made in rotary kilns than in the old-style shaft kilns which they superseded, but automatic shaft kilns are available to-day that make it possible to produce cement in no way inferior to that made in rotary kilns. This, of course, requires modern methods of crushing and grinding, suitable mixture of the dry raw material, adequate grinding of the kiln feed and clinker in modern-type mills, calcination in automatic kilns with improved accessory devices, and thorough inspection and testing during the process of manufacture.

A practical example is given by the modernization and extension of the Goliat shaft-kiln Portland-cement plant of the Sociedad Financiera y Minera of Malaga, Spain, which not only doubled the producing capacity but also doubled the strength of the product in the 7- and 28-day tests. Limestone is crushed in a newly-installed hammer-mill crusher with a capacity of 60 metric tons per hour, and is dried. Marl is crushed in another hammer-mill of smaller capacity. Dried limestone and marl are withdrawn in quantities accurately proportioned by plate feeders, and are pulverized in a three-compartment mill. This raw mix and coal are fed to the kilns automatically. The kilns themselves were originally 3.5 meters (11½ ft.) in diameter and 8 meters (26 ft.) high, and the task of modernizing consisted partly in the installation of automatic auxiliary equipment and partly in raising the height to 12.5 meters (41 ft.). There are three kilns, and only one kiln was changed over at first, leaving two operating at a rate of 50 tons of clinker each per day. The enlarged first kiln gave a capacity of 100 tons a day, equal to the other two, so that the reconstruction of the latter could be carried out without undue haste.

The kilns discharge through automatic devices which withdraw the clinker in uniform quantities and at uniform state of calcination, and furthermore remain sealed against the admission of fresh air at the bottom of the shaft, which would reduce temperature and pressure. The clinker is ground in a mill similar to the raw mill. Fuller-Kinyon pumps are used for conveying both the raw mix and the finished cement. A thoroughly-equipped physical and chemical laboratory keeps close watch on all stages of the cement-making process and conducts regular tests on the cement produced; this laboratory is one of the vital factors in achieving the great increase in the quality of the cement.—Augusto Bues (manager of the Goliat plant) in *Cemento* (Barcelona), 3:225-233, July, 1931.

Arsenous Cement of Low Solubility Is Developed

At the laboratory of the College of Engineering at Stockholm investigations have been under way for about two years with the object of meeting the existing demands of modern concrete practice through a rational specialization of cement manufacture. These researches, which are based on mechanical as well as on physico-chemical studies, have in view, among other things, the production of a cement characterized by low solubility and thus particularly suited for construction in water. A contribution to this investigation is the research on the effect of arsenic trioxide on Portland cement, suggested in part because great quantities of by-product arsenic trioxide are produced in the roasting of ore by the Skelleftea Bergwerks Akt.-Ges.

These investigations show that a mixed cement, containing 30 per cent. of As_2O_3 and 70 per cent. of standard Portland cement, has a very short setting time (about 5 minutes). This, however, can be prolonged at will by heating the mixture in a closed container. The higher the temperature, the longer the setting time becomes. For normal set (about one hour initial) heating to approximately 200 deg. C. is required.

The compressive and tensile strengths of mixed cements with varying content of arsenic trioxide fall with the first addition of the arsenic trioxide to a minimum when the admixture is at 10 to 15 per cent., after which the strength rises again to a maximum when the content of As_2O_3 is 30 per cent., at which the strength is somewhat lower than in the case of pure Portland cement. With arsenic-trioxide content higher than 30 per cent. the strength falls rapidly. With standard sand in a 1:3 mortar the mixed cement has a strength greater than required in the Swedish specifications for Class B Portland cement.

The lime-solubility of the Portland cement is very much decreased through addition of arsenic trioxide. The lowest solubility is at 30 to 40 per cent. admixture of As_2O_3 and 70 to 60 per cent. Portland cement, and is somewhat dependent on the age of the materials when used. With a content higher than 40 per cent. the solubility of lime increases somewhat, and there is also a great loss of As_2O_3 through solution.—Dipl.-Ing. Donovan Werner and Stig Giertz-Hedstrom in *Zement* 20:384-388, April 23, 1931.

Indiana Producer Opens New Plant in Tennessee

The Hoagland & Hardy Sand & Gravel Co. of Evansville, Ind., has opened a new plant near Camden, Tenn., and has started shipping material.

The Klinker Sand & Gravel Co., of Seattle, Wash., is making improvements at its plant including the installation of several new bins.

Recent Patents

AMERICAN

Concrete

Concrete waterproofing compound. Martin B. Chittick, Chicago, Ill., assignor to Pure Oil Co., same place. No. 1,814,292.

Skip-hoisting mechanism for concrete-mixers. Erich H. Lichtemberg, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,814,564.

Process of mixing concrete. Wilson A. Jaicks, Chicago, Ill. No. 1,815,357.

Excavating

Shoveling-machine. William Whaley, Knoxville, Tenn. No. 1,814,067.

Excavating apparatus. Dwight J. Shelton, Marion, O., assignor to Marion Steam Shovel Co., same place. No. 1,814,863.

Replaceable excavator-tooth. Glenn E. Edmunds, Columbus, O., assignor to Bonney-Floyd Co., same place. No. 1,815,649.

Dipper-tooth. Oscar W. Andersen, Oak Park, Ill., assignor to Pettibone-Mulliken Co., Chicago, Ill. No. 1,815,819.

Dipper-tooth. Oscar W. Andersen, Oak Park, Ill., assignor to Pettibone-Mulliken Co., Chicago, Ill. No. 1,815,820.

Bucket attachment for excavating-machines. George L. Martin, Madawaska, Me. No. 1,816,291.

Dipper-bucket. Earl H. Fundom, Lima, O., assignor to Pettibone-Mulliken Co., Chicago, Ill. No. 1,816,522.

Reversible excavator-tooth with socketed tip. Donald H. Young, Berkeley, Cal., assignor to American Manganese Steel Co., Chicago, Ill. No. 1,816,710.

Grinding

Attrition mill. Royal Lee, Milwaukee, Wis., assignor to Lee Engineering Research Corp., same place. No. 1,816,050.

Material Handling

Control mechanism for distributing buckets. Oscar Sheck and Emil Tranaas, Milwaukee, Wis., assignors to Koehring Co., same place. No. 1,815,682.

Propelling mechanism for traction-operated machines. Berlin S. Ferguson, Marion, O., assignor to Marion Steam Shovel Co., same place. No. 1,815,839.

Unclassified

Hopper car construction. William J. Hosceit, Chicago, Ill., assignor to Rodger Ballast Car Co., same place. No. 1,813,928.

Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place. No. 1,815,872.

Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place. No. 1,815,873.

Plaster-mixing machine. Henry S. Johns, Hamilton, Ont., Can., assignor to Bancroft Holdings Ltd., same place. No. 1,816,588.

FOREIGN

Cement and Concrete

Process for the production of alumina cement. Fritz Frenzel, Dessau. German 529,203.

Concrete-admixture composition. Claude D. Cory, Seattle, Wash. Canadian 313,361.

Crushing and Grinding

Coal breaker. F. Pardee. British 346,026.

Apparatus for grinding and sifting. E. Barthelmess. British 345,996.

Machines for the reduction of materials, such as ball mills. J. E. Kennedy. British 346,375.

Pulverizing mills. International Combustion Engineering Corp. British 346,428.

Grinding or crushing mills. F. E. Marcy. British 346,665.

Sieve-plate for centrifugal and hammer mills. Alpine Akt.-Ges. Eisengiesserei und Maschinenfabrik and Otto Gaiser, Augsburg. German 529,270.

Discharge device with sieve for tube mills. G. Polysius Akt.-Ges., Dessau. German 529,034.

Crushing device for hard material. Paul Louis Crowe, Baltimore, Md. German 529,035.

Screening-type centrifugal mill. Paul Gertsch, Marseilles, France. German 529,396.

Single or multiple-compartment grinding mill, in which air enters the grinding chamber through openings in the trommel shell. Adolf Steinbruckner, Duisburg-Manheimerort, Germany. German 529,442.

Mill with pneumatic sifters. Emil Barthelmess, Dusseldorf-Oberkassel, Germany. Canadian 313,154.

Grinding mill. John R. Kueneman, Oakland, Calif. Canadian 313,390.

Drilling

Rock-drill shanks, steels or the like. H. S. Potter. British 346,217.

Impact tools operated by centrifugal force. A. Nurnberg. British 346,555.

Roller-cutter boring-drill. Chicago Pneumatic Tool Co. British 346,946.

Drilling-machines. J. Archdale & Co., Ltd., and J. Jewsbury. British 346,971.

Valve mechanism for rock drills. W. W. Triggs (Ingersoll-Rand Co.). British 347,069.

Drill. Dipl.-Ing. Hans Lembcke, and Dipl.-Ing. Paul Schmidt, Munich. German 529,208.

Device for compressed-air hammer-drill. Fried. Krupp Akt.-Ges., Essen. German 528,979.

Rig for rotary drills. William J. Mitchell, San Francisco, Cal. Canadian 313,199.

Drying

Process and apparatus for the combined pneumatic drying and subsequent pneumatic heating of materials. P. Rosin. British 346,541.

Drying of minerals and other substances. C. M. Smith. British 346,783.

Drying apparatus. I. G. Farbenindustrie Akt.-Ges., Frankfurt A. M. German 529,379.

Excavating

Stripping, excavating and conveying machine in the form of cable-crane. Lubecker Maschinenbau-Gesellschaft, Lubeck. German 528,980.

Arrangement of the tail-guide block for the cable of a drag scraper. Demag Akt.-Ges., Duisburg. German 529,209.

Mining scoop. Elisabeth Jordan, nee Schleuss, Berlin-Lichterfelde. German 529,313.

Cableway-bridge stripping machine with variable span. Carlshutte Akt.-Ges. fur Eisengiesserei und Maschinenbau, Waldenburg-Altwasser. German 529,293.

Digging element for excavating machines. The American Manganese Steel Co., Chicago, Assignee of Donald H. Young, Berkeley, Calif. Canadian 313,430.

Gypsum

Process for the production of calcium sulphate hemi-hydrate. Dr. Ferdinand Krauss, Braunschweig. German 528,864.

Wallboard reinforcement. The Canadian Gypsum Co., Ltd., Windsor, N. S., assignee of the United States Gypsum Co., Chicago. Canadian 313,248.

Reinforced plaster board. The Canadian Gypsum Co., Ltd., Windsor, N. S., assignee of the United States Gypsum Co., Chicago. Canadian 313,250.

Kilns and Coolers

Rotary-kiln cooler with several cooling tubes. G. Polysius Akt.-Ges., Dessau. German 528,957.

Chain device inside rotary kiln for burning cement by the wet process. Johan Sigismund Fasting, Copenhagen, Denmark. German 529,125.

Process for operation of tunnel kilns. Holding-Gesellschaft fur Keramische Werte, Luxemburg. German 529,707.

Material-Handling

Reversible jigger-conveyor. J. J.

(Continued on page 72)

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Manufacturers' Publications

Each publication listed below contains information of interest to nonmetallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Bearings

New Departure Ball Bearings. 62 p. (The New Departure Manufacturing Co., Bristol, Conn.) The seventh edition of a comprehensive, thumb-indexed handbook on ball bearings. Contains dimensions, load data and prices.

Blasting

"Something New in Quarry Blasting." 2 p. (*The Dupont Magazine* for Midsummer, 1931. E. I. duPont de Nemours & Co., Inc., Wilmington, Del.) Describes and illustrates an interesting shot at the Monacacy, Pa., quarry of the John T. Dyer Quarry Co. (See also page 35, June 17, 1931, issue of PIT AND QUARRY.)

Clutches, Magnetic

Keeping Pace with Machine Design. 24 p. (Cutler-Hammer, Inc., Milwaukee, Wis.) Describes and illustrates the construction, maintenance features and adaptability of a series of magnetic clutches.

Conveyors, Portable

Porta Trough Conveyor. 4 p. *Porta Sectional Conveyor.* 4 p. (Portable Machinery Co., York, Pa.) Describe and illustrate portable trough conveyors and sectional conveyors for handling sand and gravel, crushed stone, concrete and similar loose materials.

Excavators

Koehring No. 401. 48 p. (National Equipment Corp., Milwaukee, Wis.) Describes and illustrates a new shovel-crane-dragline of 1-cu.yd. capacity. A wide range of operating speeds and flexibility of control are available.

Machinery, Rebuilt

Guaranteed Motors, Generators, Compressors, Etc. (Bull. No. 39. Rockford Power Machinery Co., Rockford, Ill.) Lists and describes a wide variety of rebuilt motors, generators and other electrical equipment. The price of each machine is given.

Miscellaneous

Hydro-Seal. 8 p. (The Quigley Co., Inc., New York, N. Y.) Describes and illustrates a waterproof sealing compound for making tight joints in water, gas and air lines.

Motors

Type T Heavy Duty Reliance Motors. 32 p. (Bull. No. 209. Reliance Electric & Engineering Co., Cleveland, O.) Describes and illustrates a series of heavy-duty, general-service motors for direct current. Built in a wide range of horsepower ratings.

Synchronous Motors. 16 p. (Bull. No. 520. The Ideal Electric & Manufacturing Co., Mansfield, O.) Describes and illustrates the Ideal "flywheel" type synchronous motor and six standard types of synchronous motors. Power ratings are from 1 to 3,000 hp.

Pipe

Forge Welded Pipe. 88 p. (Cat. No. 31. Taylor Forge & Pipe Wks., Chicago, Ill.) Contains many detailed data of value to engineers interested in large-diameter piping. Several pages are devoted to the design and adaptation of joints for large-diameter pipe. The catalogue is well illustrated.

Pulverizers

Solve Your Grinding and Separating Problems with a Bradley. 24 p. (Bradley Pulverizer Co., Allentown, Pa.) Describes and illustrates the entire line of products manufactured by this concern and gives the principal characteristics of each machine.

Pumps, Centrifugal

Type D Monobloc Centrifugal Pumps. 8 p. (Worthington Pump & Machinery Corp., New York, N. Y.) Describes and illustrates a new centrifugal pump and motor built as a unit for medium-duty industrial service.

Screens

The Robins Gyrex Screen. 20 p. (Bull. No. 80. Robins Conveying Belt Co., New York, N. Y.) Describes and illustrates a line of vibrating screens and shows views of the equipment as installed in representative plants in a number of industries.

Tractors

The Camel. 8 p. (Shunk Manufacturing Co., Bucyrus, O.) An illustrated leaflet portraying the versatility and adaptability of a tractor dump wagon. Action views tell the story of the operation of the machine in pit, quarry and on the construction job.

Wire Rope

"Correctly Estimating Remaining-Strength." 4 p. (*Wire Engineering* for June-July, 1931. John A. Roebling's Sons Co., Trenton, N. J.) An illustrated article explaining how the remaining strength of wire rope in service may be estimated using the number of broken wires per rope lay as the proper basis.

Recent Patents

(*Continued from page 71*)

Hughes and D. Hughes. British 346,346.

Wire-rope fabrics for use in conveying-belts. S. Sokal (Stumm-Konzern Ges.). British 346,654.

Construction of apparatus for feeding powder or pulverulent material to weighing or other machines or receptacles. W. G. Simon and F. R. Simon. British 346,877.

Conveyors. J. Thompson (Wolverhampton) Ltd., H. E. Partridge and J. Collinge. British 346,909.

Guiding or supporting rollers for belt conveyors or the like. A. Hopkinson. British 346,934.

Belt and like conveyors. G. J. Fisher. British 346,982.

Device for distributing bulk materials. Firma Polte, Magdeburg. German 528,868.

Screw conveyor set upright. G. F. Lieder G. m. b. H., Wurzen i. Sa. German 529,183.

Shaking conveyor. Hugo Klerner, Gelsenkirchen, Germany. German 529,185.

Device for connecting the members of swinging trough conveyors. Mines Domaniales de Potasse d' Alsace, Mulhausen, France. German 528,869.

Device for uniform spouting of loose materials. Paul Zurstrassen, Ettlingen. German 529,294.

Mixing

Concrete mixers. J. S. Withers (Koehring Co.). British 346,109.

Device for measuring water, particularly for concrete mixers. Karl Peschke Maschinenfabrik, Zweibrucken. German 529,378.

Sacking and Packing

Machines for filling and weighing bags and the like. Soc. d' Etudes d' Eusachage et de Manutention. British 346,772.

Process and apparatus for packing definite quantities by weight of pulverous material. K. Middelboe. British 346,985.

Closing-device for filled sacks. Librawerk m. b. H., Gliesmarode b. Braunschweig. German 529,045.

Screening and Separating

Method of and means for separating granular, powdered and like materials. W. D. Williams. British 346,002.

Rotary separating or screening apparatus. N. H. R. Griffin. British 346,330.

Separation of dry materials. C. W. H. Holmes and Birtley Co., Ltd. British 346,266.

A Correction

In the Wheeling, W. Va., plant of the Standard Sand & Gravel Co. barges are unloaded by means of a Williams 2-cu.yd. capacity clam-shell bucket instead of a Hayward bucket as noted in the article describing the operations of this plant in the July 15 issue of PIT AND QUARRY. The Williams bucket has been in service for more than seven years in this installation.

Insurance Problems Discussed

Surety Bonds

IT has been a great tribute to the moral stamina of America that dishonesty is not more general at present. These are trying times. If you were being pinched by creditors or by the illness of a child and the extra money lay right under your nose, it would be an act of courage to fight the battle through and keep straight. We survived 1930 much better than we might have expected. But if the coming winter is severe and if employment and salaries are slow in picking up, there will be a further strain on the moral fiber of the country and employers will do well to give extra forethought to protecting their property.

Facing an Embezzler

Have you ever faced an embezzler when he was first caught? It is just like a bad dream or a story from a fiction magazine. You can not make yourself believe that you are living through a reality. Our insurance broker tells us of his strange feelings during his first experience, when one of his clients caught an old employee, who was a personal friend of both the client and the broker. This was no hardened criminal. It was a friend in whom everyone had confidence. What he said sounded just like the story books; yet he was telling us the truth. He wasn't making as much money as he used to and he "loved his wife so much" he could not bear to tell her about the reduced income. So he just "hung on temporarily" to some customer's money, figuring that he could increase his sales and pay it back out of his commissions. In every other respect he was faithful to his family and his employer. He simply did not see that, regardless of his intentions about paying back, it was up to him as a man to tell his wife the truth about his cut in income instead of having her maintain a false standard of living. "Embezzlement" is a hard word to use when you are sitting across the desk from a friend, but this "borrower" does just as much harm to his family and his employer as the deliberate criminal. The money is gone forever, and the family and friendly relations are broken.

Of course the shaking of confidence is worse when an executive of a firm takes something that does not belong to him. We have just been through a case where the comptroller of a corporation juggled entries in the books so as to get $15,000 in two years before he was caught. This comptroller was pretty smart; he bought the firm's insurance and saw to it that he was not placed under bond—so when he was caught he had only his employer to argue with. This story is just one of the old ones: the comptroller had some old debts and tried to make up his deficit by using his firm's money to play the races. He lost, and so he was sure to be caught.

A third sad case that we have seen recently was that of a middle aged cashier. His wife had always wanted nice things, and as his business hopes dimmed with advancing years he just could not stand to have his wife's desires unsatisfied; so he "borrowed" a few hundred dollars to make some extra money on the stock market—but his stock went down instead of up!

The point of these stories is not to arouse your suspicions of your own employees or to imply that dishonesty among workers is widespread. What we do want to point out is that the old, old stories of horse races, the stock market and weak courage are being reënacted to-day by flesh-and-blood people that you and we know. Embezzlers usually do not think up any orginal plan. They are inspired by the same old cravings for extra money and they show no more skill than they did a generation ago at covering up their acts. They are not fast livers, but in most cases are sober, home-loving men.

So often insurance men hear producers say, "Yes, if I had a stranger in a position of trust, I would put him under bond." A client called up his insurance broker the other day and said he wanted to bond a certain salesman. On investigation it developed the salesman had already collected four hundred dollars which he had not turned in, and the producer thought he would be safe in keeping a good salesman if he could transfer the losses to an insurance company. Now this represents an attitude that is frequently met. Employers think the insurance companies should bond anybody. You can not safely rely on a bond for a trouble maker; you should discharge him.

Trusted Employees

It is an axiom of business that most embezzling is done by old and trusted employees. New employees, or men who do not enjoy the firm's confidence, do not take their employer's money because they are never put in positions of trust where they can get their hands on money. It is only the trusted men who have a chance to get away with money. That is why, without casting suspicion on any individual, we feel that all who are in positions of trust should be bonded.

After an employer has agreed that it is good general business practice to carry a fidelity bond, he is perplexed by the question of whom to cover. You do not want to bond everybody. The opportunity for a stenographer or a common laborer to take anything is so slight that it would not be worth paying an insurance premium. Every employee who handles cash or keeps books of course should be bonded. As for the executives, it seems incredible that we must recommend bonding. These men should have intelligence and ambition enough to work for the company's interests whole-heartedly, but the records show unfortunately that embezzling is not uncommon among executives and the losses run into larger figures than those among the lower ranks.

There are other classes of employees whose opportunities for dishonesty will be seen by a careful analysis. Buyers—those who have the authority to bind the company with contracts—and receiving or shipping clerks, can cheat their employers. Their job is a little hard, because it requires collusion with some other firm, but on the other hand these losses are harder to detect and many run on for a long time before they are caught.

The purpose of this article is not to predict a moral upheaval in corporations. But we believe in facing the possibilities of present business conditions and recommend that you talk over your own situation with your insurance broker.

Besser Mfg. Co. Acquires Stock of Rival Concern

The Besser Manufacturing Co. of Alpena, Mich., recently acquired by purchase from private interests, a substantial block of the capital stock of Consolidated Concrete Machinery Corp., Adrian, Mich.

This inter-ownership of stock in two of the leading companies manufacturing concrete-products equipment is in no sense a merger of the two companies. While the new affiliation will bring benefits of coöperation that will prove of advantage to the industry as a whole, it will not result in any unusual changes in the line of equipment, the personnel, or sales organization of either company.

To Erect Fullers' Earth Plant at Gonzales, Texas

A plant for crushing and drying fullers' earth is being constructed at Gonzales, Tex., by the Coen Co., Inc., of California. Increased demand for the product, due to the number of new refineries in East Texas, has caused steps to be taken to open up new deposits of the raw material.

New Machinery and Supplies

New Welding Sets Have Quickly-Responsive Arc

The General Electric Co. announces a new line of single-operator welding sets in which are incorporated many improvements over past designs. This has been designated the WD-20 line as the types are numbered WD-21, 22, 23, 24 and 26, covering the 100-, 200-, 300-, 400- and 600-ampere ratings respectively.

It includes both portable and stationary sets, the basic form being stationary with but a slight change needed to make it portable. Types include those for operation on either alternating or direct current at all standard voltages and, in the case of alternating current, standard frequencies and 2- and 3-phase gasoline-engine-driven sets will also be available.

Among the principal advantages of the line are the use of two-bearing construction on the a-c. types up to 600 amperes; compactness and light weight; and greatly improved welding characteristics. The sets are self-excited with a tapped series field for major current adjustments and a shunt-field rheostat giving duplex voltage control.

The latest design of standard a-c. motor has been specially adapted for use in the a-c. sets. Generators are of a distinctive new design while retaining all the good features of the past equipment. The direct-current motors are of the latest standard d-c. design.

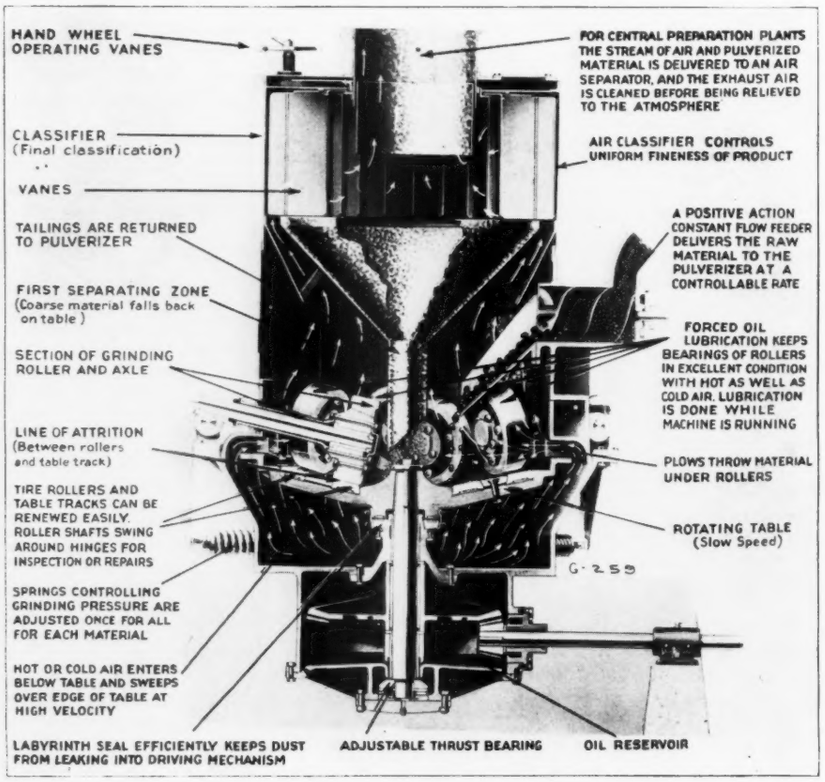
A typical a-c. set consists of a generator with an over-hung driving motor mounted on a simple base to which is attached a strong sheet-metal control cabinet inclosing the generator control devices, meters and motor-starting equipment. A specially designed transformer-reactor is mounted in the base under the generator. Base supports are arranged to be bolted to the floor or to have axles and wheels readily attached. The whole assembly occupies a minimum of space, a typical 300-ampere, a-c. set standing 36 inches high and 50 inches long by 23 inches wide. The weight of such a set is 1,865 pounds.

Table-Roller Pulverizer Is Entirely Redesigned

The Grindle Fuel Equipment Co., a subsidiary of the Whiting Corp., Harvey, Ill., announced recently that it had taken over the manufacture and the sale of the table-roller pulverizer previously handled by the Bethlehem Steel Corp.

Important changes have been made in the design of the bearings, the rollers, the lubrication (which is now entirely forced oil) the setting of the table on the main shaft, the seal protecting the driving gear against dust, the air classifier, etc. One-piece tracks are replacing the segmental tracks used previously. Furthermore, it is possible now to run the pulverizer at very low capacity, or at maximum capacity with equally good results, an important feature for industrial plants with variable loads.

The most outstanding advantage is claimed to be the extremely low power consumption.


HAND WHEEL OPERATING VANES
CLASSIFIER (Final classification)
VANES
TAILINGS ARE RETURNED TO PULVERIZER
FIRST SEPARATING ZONE (Coarse material falls back on table)
SECTION OF GRINDING ROLLER AND AXLE
LINE OF ATTRITION (Between rollers and table track)
TIRE ROLLERS AND TABLE TRACKS CAN BE RENEWED EASILY. ROLLER SHAFTS SWING AROUND HINGES FOR INSPECTION OR REPAIRS
SPRINGS CONTROLLING GRINDING PRESSURE ARE ADJUSTED ONCE FOR ALL FOR EACH MATERIAL
HOT OR COLD AIR ENTERS BELOW TABLE AND SWEEPS OVER EDGE OF TABLE AT HIGH VELOCITY
LABYRINTH SEAL EFFICIENTLY KEEPS DUST FROM LEAKING INTO DRIVING MECHANISM
ADJUSTABLE THRUST BEARING
OIL RESERVOIR
FOR CENTRAL PREPARATION PLANTS THE STREAM OF AIR AND PULVERIZED MATERIAL IS DELIVERED TO AN AIR SEPARATOR, AND THE EXHAUST AIR IS CLEANED BEFORE BEING RELIEVED TO THE ATMOSPHERE
AIR CLASSIFIER CONTROLS UNIFORM FINENESS OF PRODUCT
A POSITIVE ACTION CONSTANT FLOW FEEDER DELIVERS THE RAW MATERIAL TO THE PULVERIZER AT A CONTROLLABLE RATE
FORCED OIL LUBRICATION KEEPS BEARINGS OF ROLLERS IN EXCELLENT CONDITION WITH HOT AS WELL AS COLD AIR. LUBRICATION IS DONE WHILE MACHINE IS RUNNING
PLOWS THROW MATERIAL UNDER ROLLERS
ROTATING TABLE (Slow Speed)
G-259

Explanatory view of the table-roller pulverizer.

Ransome Will Make Transit Mixer Carriers

The Ransome Concrete Machinery Co. of Dunellen, N. J., has acquired controlling interest in Transit Mixers, Inc., and will hereafter manufacture at its plant in Dunellen for that concern, its well known Transit Mixers. Users of this equipment will, therefore, be given the benefit of Ransome's years of engineering and manufacturing experience in building concrete mixers.

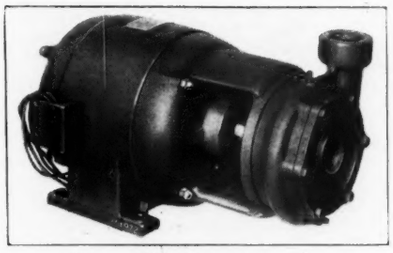
There will be no change in the position or policy of the Ransome Concrete Machinery Co. in the field now occupied by it. The two companies will operate as distinctly separate units and the Ransome Concrete Machinery Co. has no connection, by license agreement or otherwise, with any other concern in the truck-mixer field.

Ransome's purpose in acquiring control of Transit Mixers, Inc., is to find employment for its capital and facilities in this new field, in which it has not heretofore competed.

Centrifugal-Pump Meets Many Industrial Needs

There long has been a need in the industry for a centrifugal pump of good efficiency, low initial cost and low maintenance expense—the design and construction of which is such to insure good service with but little care and attention. This need now is met by the Monobloc Type D centrifugal unit, according to the Worthington Pump & Machinery Corp., Harrison, N. J., which recently placed the new unit on the market.

The pump, simple and rugged, is bolted to the extended motor frame and the impeller is mounted on the end of the continuous motor shaft. The bronze impeller incorporates the shaft sleeve as an integral part, this construction being one of Worthington's latest shaft-protection developments. The cadmium-plated steel locking device for the impeller, the forged bronze packing gland, and the arrangement of shaft water-throwers, are other important features of this pump.



New centrifugal pumping unit.

The ball-bearing Masterbilt motor, designed especially for Worthington, incorporates standard electrical construction. Combined with the pump, it affords a high-class, moderate-priced pumping unit for the services for which it is intended.

The simplicity and thoroughness of the design of this new unit is the result of Worthington's many years of experience in Monobloc construction in the higher-priced field. All the important features found necessary in units of this type have been incorporated to perfect a smooth running and reliable electric pump.

New Industrial Steam Locomotive Introduced

The Vulcan Iron Works of Wilkes-Barre, Pa., has developed a new type of locomotive, said to be the first of its kind built in America. This Vulcan Duplex locomotive was only recently completed and is now in actual service at the operations of the Dick Construction Co., Inc., which does extensive coal-mine stripping in the Hazleton region, for the Lehigh Valley Coal Co.

The new design meets the demand for a comparatively heavy steam locomotive, distributing the weight over a greater length of rail and a greater number of ties, making it easier on track upkeep and especially adaptable to all conditions involving the handling of heavy loads on steep grades with sharp and kinky curves on poorly-laid track. It has an advantage over the simple rod locomotive of rigid frame wheel-base in having two swiveling trucks, enabling it to turn on sharper curves and provide for greater traction on poorly-constructed road beds.

The locomotive illustrated weighs 55 tons in full service order, with the weight properly distributed over eight driving wheels. The 8-wheel arrangement consists of two four-wheel swiveling trucks, each having a pair of 13-in. by 16-in. piston-valve-type cylinders, with valves controlled by Walschaert gear. Each truck is a complete unit in itself and obtains its steam through flexible connections from the boiler. Driving wheels are 36 in. in diameter, the truck wheel-base 5 ft., and the total wheel-base 26 ft. 5 in. The length of the locomotive over bumpers is 32 ft. 6 in.

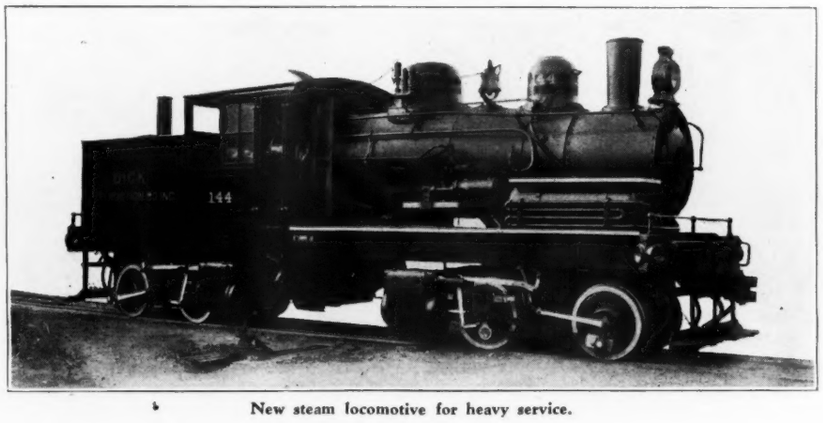
The main locomotive frame, which carries the boiler, cab, tank and upper structure, is of heavy structural steel, tied together with heavy, cast-steel bumpers and cross ties and provided with standard A.R.A. automatic couplers. The boiler has been designed with the utmost economy in mind and fuel consumption will be at a minimum. The boiler is of extended wagon-top type with charcoal-iron tubes. It gets its water supply from the rear tank by means of a feed pump and also an injector. The working pressure is 200 lb. The water tank, located over the rear engine truck, holds 1,400 gal., and is equipped with a feed-water heater. Space is provided for approximately 5,000 lb. of coal.

The locomotive is equipped with Westinghouse Modified No. 6-ET air-brake apparatus, which includes an 8½-in. cross-compound compressor and suitable hose connections to the train. One sand dome on the boiler furnishes sand to the front engine drivers while a separate sand box on the rear water tank provides sand for the rear engine drivers. The sanding arrangement is controlled by air or hand.

The reversing of the locomotive is effected by a Ragonnet reverse gear with the cylinder located on the right side of the boiler above the main frame. The firedoor is of the Franklin "butterfly" type.

The unusual power of the locomotive is reflected in the high tractive effort developed under preliminary tests which showed a reading of upwards of 30,000 lb. A notable feature of the locomotive is the steam control. By means of a special arrangement in the steam line, both trucks may be operated simultaneously or the steam to either truck may be partly or completely shut off to prevent slipping of wheels. This operates entirely independent of and does not interfere with the main throttle.

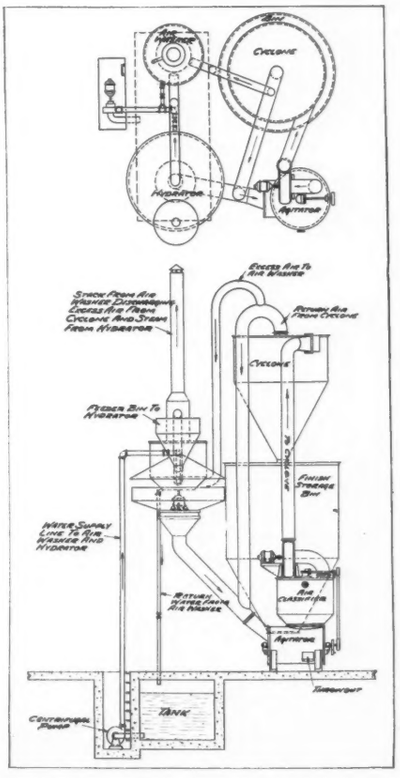
Generally speaking, this locomotive has met all the expectations of the builders, and it is their intention further to develop this design into a range of sizes or weights to meet practically all industrial haulage requirements that involve operating conditions for which it is primarily and specially adapted.



New steam locomotive for heavy service.

Agitator, Air Separator, Washer for Lime Plants

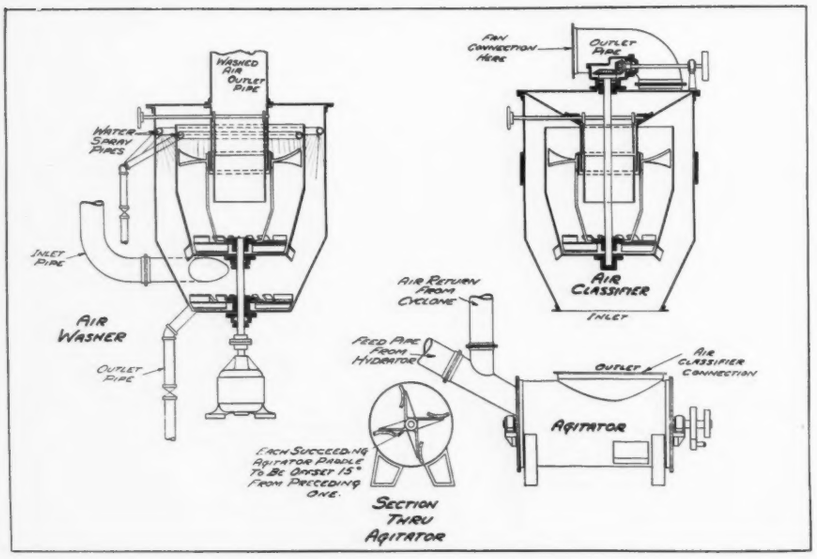
Three new machines designed for the hydrated-lime industry were brought out recently by the Mechanical Cyclonic Classifier Co., Alton, Ill. These machines include a new dust,



Application of the washer, agitator and classifier in the production of lime.

hot gas, and steam washer, a bottom-intake air separator and an agitator.

The new washer is designed to wash the obnoxious gases and dust emitted from the steam stacks of lime hydrators and from the air vents of beater mills and cyclone collectors. It is mounted adjacent to the hydrator where it receives directly the gases and dust from their sources. Through its high-speed centrifugal action, it is impossible for dust or solids to escape through the outlet of the washer. The



Construction and operating details of the washer, classifier and agitator.

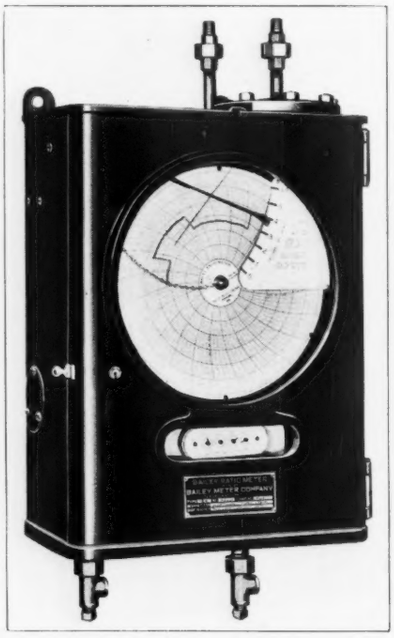
return water from the washer is available for use again in the hydrator, thereby reclaiming the fine lime contained therein.

The new agitator and bottom-intake air separator offer wide adaptability to handling materials of peculiar characteristics, and they are especially adaptable to the separation of fine material from the tailings. In operation, the agitator takes the place of an ordinary beater mill and is large enough to handle a complete batch of material from the hydrator. It will mix the batch, without pulverizing the impurities, until the circulating air through the air separator has taken out all the desired fines. The bottom-intake air separator mounted on the agitator is of the centrifugal type and is adjustable for any desired fineness while in operation. Together the agitator and air separator can be installed so a small portion of extremely fine lime can be removed while the remainder passes on and through a regular beater-mill system.

Ratio Meter a Guide to Combustion Efficiencies

A recent and important development of the Bailey Meter Co., Cleveland, O., is the Bailey ratio meter for use as a combustion guide in the firing of gas- or oil-fired heaters, kilns, and all types of industrial furnaces.

The primary purpose of the ratio meter is to provide furnace operators with an easily understandable guide which will enable them to maintain a definite relation between the amounts of air and fuel supplied to the furnace so as to obtain high combustion efficiency. This is accomplished by an ingenious method. Referring to the accompanying illustration, it will be noted that the meter contains two recording pens. One records the rate of oil flow and is actuated by a simple mechanical type of mechanism which receives its motive power from the differential pressure produced by an orifice in the fuel line. In similar manner, the shorter pen records the flow of air to the furnace. At the time the meter is being installed, a complete combustion test is run on the furnace to determine what ratio between air flow and fuel flow corresponds to best



Ratio meter for controlling the efficiency of combustion.

combustion conditions, and the air-flow mechanism is then adjusted so that this ratio is always obtained when the two records coincide, one upon the other. The furnace operator, therefore, merely has to keep the two pens together by proper manipulation of the air supply to be assured that maximum economy is being secured.

Should the air-flow pen be above the fuel-flow pen, it is an indication that too much air is being supplied with a consequent increase of stack losses. Conversely, should the air-flow pen be below the oil-flow pen, it is an indication that too little air is being supplied with consequent loss due to unburned fuel.

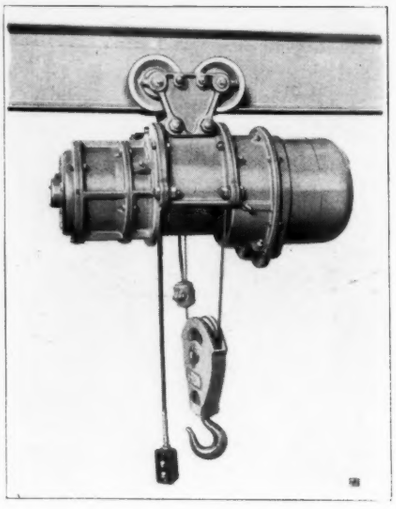
In addition to serving as a combustion guide, the ratio meter is valuable as a fluid meter on the fuel line. It records and indicates the rate of flow in any convenient terms, and the total flow may be given by the four-dial integrator which may or may not be installed in the meter as desired. Thus the meter furnishes daily graphic pictures of furnace operation and supplies data for cost-accounting systems.

The ratio meter has been so designed that it is possible to install auxiliary recorders of temperature or pressure when advantageous, to give records of these factors on the same chart with the flow records. This feature makes comparison of related factors a simple task, especially since the 12-in. diameter charts are uniformly graduated and are marked with direct-reading scales. Each factor is recorded in an individual color so that it can be easily distinguished from other records.

Electric Trolley Hoists for Mounting on I-Beams

The new line of electric trolley hoists manufactured by the Wright Manufacturing Co., Bridgeport, Conn., is complete in every respect, consisting of the plain, geared, and motor-driven trolley types. The bearings of the trolley wheels are designed to absorb both radial and thrust loads, thus reducing the effort to move the trolley along the I-beam to a minimum.

The trolleys come in plain, geared, and motor-driven patterns. In the motor-driven trolleys, the wheels are driven on each side of the I-beam insuring smooth operation, and are equipped with a safety stop. Control-



Hoist with push-button control.

lers for single speed, two speed, or variable speed can be furnished.

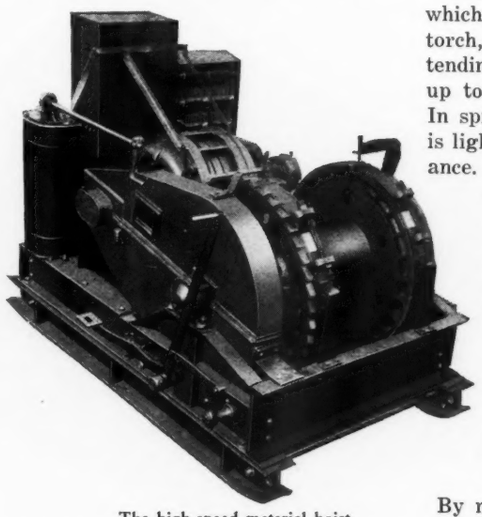
The hoists can be mounted either parallel or at right angles to the runway beam. While the standard lift is 18 ft., lifts of 9 ft. and 36 ft. can be furnished.

Features of the hoist include full-size drums for long cable life, push-button or pendant-rope control, Tru-Lay preformed cable, safety-type limit switch, positive braking, and weather-proof motors.

Aluminum-Alloy Friction Heads Feature New Hoist

In developing its new material hoist (sometimes called a hod hoist or high-speed builders' hoist) the American Hoist & Derrick Co., of St. Paul, Minn., followed its standard practice of introducing all known improvements in the design.

A band friction clutch was considered at first because such a clutch is not influenced by centrifugal force if properly balanced. But on account of the poor slipping qualities of the band clutch, the design was abandoned and means to reduce the action of centrifugal force on the American umbrella friction—the large diameter, cool running frictions which expand outwardly to engage the drum—were investigated. After tests it was proved that by using aluminum-alloy friction heads the drum-shaft could be rotated at 250 r.p.m. without engaging the friction. As the maximum speed of the shaft under working conditions is only 150 r. p. m., there was an ample margin of safety. The design was adopted, several machines built and tested successfully.



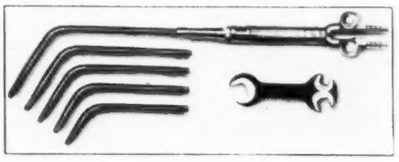
The high-speed material hoist.

Other modern features of the machine are: silent chain drive; anti-friction bearings throughout, even in the drum hubs; welded- and riveted-steel bed; forged-steel cut ratchet; visible pawl; removable steel laggings of various diameters; two 40-in. diameter, 5-in. face asbestos-lined ventilated brakes with outside adjustment; wide-face steel skids; electrical equipment mounted and wired on detachable steel plate for easy change of equipment from a-c. to d-c. current or gasoline power; improved roller-ratchet brake.

The use of aluminum friction heads enabled the American Hoist & Derrick Co. to retain one of the most outstanding features of its machines, namely, the perfectly balanced, smooth action, cool running, American expansive friction clutch. It boosted the speed limit from 125 to over 250 r.p.m.

Improved Welding Torch and Cutting Attachment

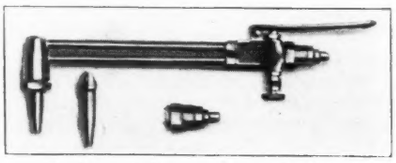
The Linde Air Products Co., New York, N. Y., has recently made two new additions to its line of Purox medium-pressure apparatus for oxy-acetylene welding and cutting.



Welding torch, tips and wrench.

The new Purox No. 11 welding torch, which supersedes the Purox No. 10 torch, has a wide welding range, extending from the lightest sheet metal up to work as heavy as ½-in. plate. In spite of this wide range the torch is light in weight and has perfect balance. The tips are of one-piece, hard-drawn copper and are so designed that the head angle can be easily adjusted as desired by the user. Tips No. 2, 4, 6, 8, and 10 are furnished as standard equipment.

The Purox No. 21 cutting attachment, designed for use with the Purox No. 11 welding torch, will cut metal up to 2 in. in thickness. It is furnished with one- and two-piece cutting tips. By means of this cutting attachment the welding torch can be easily and quickly converted into a cutting torch. This is said to be the lightest cutting attachment on the market, weighing only 1 lb. 8 oz.



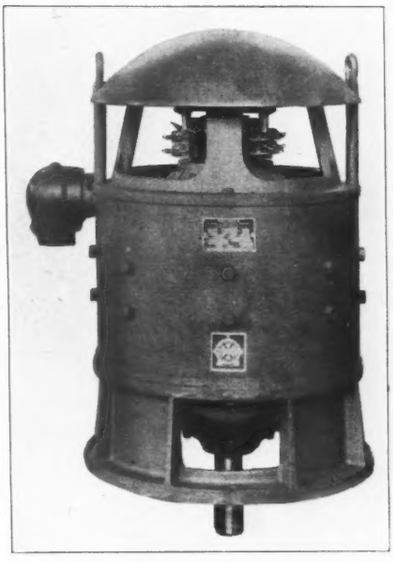
Cutting attachment, tips and adaptor.

An adaptor is also available which makes it possible to use the Purox No. 21 cutting attachment with the Purox No. 20 welding torch.

Direct-Current Motors for Vertical Operation

The Reliance Electric & Engineering Co., Cleveland, O., has developed Type T direct-current motors for vertical operation in sizes up to 50 hp., 1,150 r.p.m.

These motors are provided with a ring base for mounting and a drip cover to protect them from falling dirt and chips and from dripping water, oil or other injurious solutions.



Vertical type direct-current motor.

Where it is desirable the motor can be mounted direct to the machine being driven without the ring base and appear as an integral part of the machine.

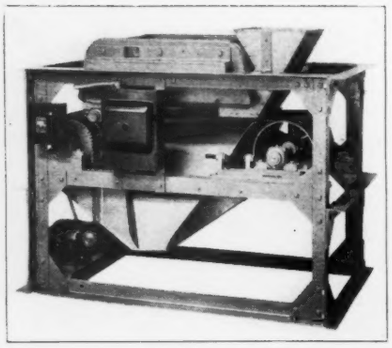
Amply large bearings are used to take up the thrust load or weight of the armature. Two heavy eye-bolts are provided to make handling easy. In all other ways the construction is the same as the Reliance Type T, direct-current, heavy-duty motor for horizontal operation.

Magnetic Separator for Finely-Ground Material

The Magnetic Manufacturing Co. of Milwaukee, Wis., has just perfected a new type of magnetic separator, said to be the first machine of its kind, which is based on an ingenious, wholly-new principle of operation.

It efficiently separates free iron from finely-ground material (20-mesh to extreme fine). Heretofore no magnetic separator could be successfully applied for treatment of such extremely fine material, and it is only by a unique and ingenious mechanical and magnetic arrangement that this unit is able to function, according to the company. It is the result of many years research on this specific problem in magnetic separation.

Manufacturers working in finely-



Magnetic separator for treating fine materials.

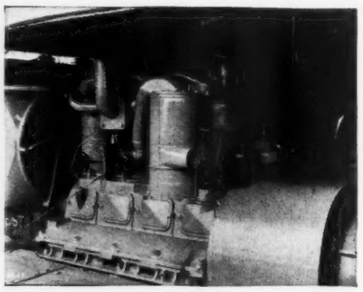
ground substances will find this machine a practical solution to the problem of effectually removing free iron from material.

The separator is known as the Stearns type Q, and is a complete, self-contained unit equipped with motor-reduction drive. It is available in a range of sizes and capacities.

Carburetor Lowers Fuel Costs, Increases Power

After many months of research and development work the engine laboratory of the Northwest Engineering Co., Chicago, Ill., builders of gasoline, electric and oil-powered shovels, cranes and drag-lines, has announced a new advance in carburetion.

This consists of a new modern type carburetor and hand idling control—a distinct advance in this type of mechanism in a shovel or crane. Its use assures greater power particularly



Engine showing the improved carburetor and control.

at low speeds in hard pulling and a more responsive throttle opening. Steady operation at part-throttle and governor idling speeds is made possible and better fuel economy is obtained. Reports from users have shown savings in some cases as high as ten gallons a day.

For the present the new carburetor is applied only to the larger engines on the Northwest line.

Ask Your Chief Executive to Assist in August Safety Meeting

By W. DEAN KEEFER
Director, Industrial Safety Division, National Safety Council

IT is to be hoped that the chief executive of your company has established the habit of attending your monthly safety meetings whenever it is possible for him to do so. If so, then he doubtless will be glad to cooperate with you in planning a special safety meeting in which he will be the chief speaker.

If he has not been in the habit of attending your monthly safety-meetings, then you should make a special effort to persuade him to come at this time. Tell him that his presence will help greatly to make accident prevention a real factor in the operation of the plant. It will encourage the members of the safety committee, and cause them to realize that, if safety is worthy of the time of the chief executive, it should be worthy of their own time. And his attendance will be a stimulating influence on every plant worker. Incidentally, the chief executive himself may be quite astonished when he attends the meeting to observe the interest of his various assistants in the plant safety program. Thus this meeting may be the means of stimulating the chief executive to give increased attention to safety problems.

Your chief executive in his informal address should touch on one or more of such subjects as:

(1) The economics of accident prevention,

(2) What safety means to workers in our plant,

(3) Why I believe in accident prevention,

(4) The members of our plant safety committee are representatives of the management,

(5) What I consider the fundamentals of accident prevention.

Your chief in the course of his remarks should prove his knowledge of the accident record of the plant as a whole, and a knowledge of the best and worst department in the plant. He should not fail to praise the departments that have good records and to encourage those whose records need improvement.

A good special topic to supplement the talk of your chief would be a discussion of "Safety Rules." Most pit-and-quarry plants, of course, have safety rules of one kind or another. Your plant may be one of the sort where the safety rules have never been clearly defined. These rules may exist merely as unwritten precedents, with the assumption that they are passed on orally from the older to the younger workers or by the foreman to the workers. It is also true that the foremen in some plants do not give any special attention to the younger workers, who are compelled to learn the safety rules and safety precautions as well as they can through the slow and costly process of experience.

In such plants, where there are no definite safety rules, it often happens that there is a certain amount of disorder and inefficiency in operations, a lack of efficiency training and safety ignorance on the part of at least the younger employees, misunderstanding and duplicated efforts in supervision, and frequent "accident happenings," which, in a certain percentage of cases, will result in damage to materials and equipment and injury to workers.

Your chief executive, or the speaker who is to follow him, should give considerable time at this meeting to a review of the safety rules of one or more departments of your company. This discussion should be started in such a manner as to encourage questions and a general discussion to determine if there should be changes in these safety rules.

If the safety rules of the company have never been clearly defined, it would be a splendid thing for the committee at this time to make a start toward their formulation. Such a program, if started at this meeting, might in fact be the means of important safety progress by the company. It would be advisable, if such a plan were started, to work out safety rules for one department at a time.

With such a program in mind, and especially if fully supported by the chief executive, a series of very important safety meetings could be planned, one meeting for an open discussion of the safety rules of each plant department. In advance of the meeting for each department a foreman could be selected to submit a tentative list of rules that could and should be enforced in his department. The foreman could prepare for this report and could stimulate real safety interest in his department by calling on his assistants and the natural leaders among his men to work with him and hand to him, by a certain date, a list of the different ways in which persons at their kind of work might be injured. The foreman then could prepare a set of rules to eliminate or control these chief possible accident causes.

This list of suggested rules should be discussed in detail at the special meeting, to make certain that they are thoroughly practical before any attempt is made to enforce them. It should be realized that it usually is much more harmful to attempt to enforce an impractical safety rule than to have no rule at all.

If a plant program for formulating safety rules is started, the chairman in charge is invited to write to the National Safety Council to secure a free copy of Safe Practices Pamphlet No. 80 on "Safety Rules—Their Formulation and Enforcement."

Legal Information for Operators

Quarry, Not Office, Held Real Place of Business

It is well settled that a corporation shall pay taxes in the county in which its principal business is located. Frequently, however, it is difficult to determine where such taxes are payable. The fact that a corporation maintains a set of books and an office in a city or county is not conclusive that the location of this office is its principal place of business. So held the higher court in the case of Iowa Limestone Co. v. Cook, 233 N. W. 682.

The facts of this case are that the Iowa Limestone Co. was organized as a corporation under the laws of the state of Iowa. Its articles of incorporation recited that its principal place of business is at Alden where it owns and operates a limestone quarry. However, an office is maintained in Des Moines, situated in a different county, where the principal set of books of the corporation is kept. A small quantity of stationery is kept in this office. The president, vice-president, and treasurer of the corporation reside there. No sales are made from the office in Des Moines. When sales of limestone are reported to the officers of the corporation in Des Moines, an order is sent to the superintendent at the quarry, who fills it.

The county in which Des Moines is located made an assessment for taxes against the corporation on account of moneys and credits of $51,-209, contending that these taxes are payable because the company maintains an office in Des Moines. However, it is interesting to observe that the higher court held the corporation not required to pay its taxes in Des Moines, saying:

"It does not appear that the appellant is doing business within the taxing district of the city of Des Moines. . . . We conclude therefrom that the principal place of business of said corporation was at Alden, in Hardin County, and that it was 'doing its business' at said place, and that the keeping of books and other transactions of said corporation in the taxing district of the city of Des Moines, as shown by the record, did not constitute 'doing business' in said taxing district."

Another important point of the law is that a state statute or city ordinance requiring "manufacturers" to pay license or taxation is not applicable to quarries and stone crushers.

For illustration, in John T. Dyer Quarry Co., 250 Pa. 589, the court held that a company engaged in operating a quarry and a crushed-stone plant is not in the manufacturing business and, therefore, it is not controlled by laws which regulate this classification of businesses. This court said:

"Quarrying is not manufacturing; neither is crushing in and of itself a manufacturing process, unless it results in the production of a new and different article. Marketing stone is certainly not manufacturing. . . . While it has extensive machinery, it is used only for the breaking of the stone or rock into the sizes required for the different purposes for which the stone is afterwards used. If the breaking of the stone into these sizes was performed, as it could be, by the manual labor of men wielding hammers and breaking the stone into the required sizes, it could scarcely be pretended that this is manufacturing. . . . The employment of the process and the use of the machinery is solely for the purpose of breaking the stone into pieces of various sizes. The rock still remains rock or stone."

Ambiguous Stone Patent Declared to Be Invalid

It is a well-settled law that a patent is void and has no legal effect if the description of the invention is ambiguous, or the patent specification does not clearly and precisely describe the patented article in such a manner that any person familiar with the art to which the invention pertains can manufacture the patented invention by referring solely to the patent specification.

For instance, in the late case of Zenitherm Co. v. Art Marble Co. of America, 45 F. (2d) 208, it was disclosed that an inventor obtained a patent on a process of manufacturing a composition used in building construction.

The owner of the patent sued a firm for infringement of the patent. During the trial the firm charged with infringement proved that, although the patent application fully described and disclosed the ingredients used in the manufacture of the product, the relative proportions of the different ingredients were not enumerated. In view of this testimony, the higher court held the patent void, and said:

"The failure to give the relative proportions of the different ingredients renders the patent void. . . . Where a patent is claimed for such a discovery, it should state the component parts of the new manufacture claimed with clearness and precision, and not leave the person attempting to use the discovery to find it out 'by experiment.'"

Also, in Wood v. Underhill, 5 How. 1, with respect to a patented compound for the purpose of making brick or tile, which did not give the relative proportions of the different ingredients, the court said:

"When the specification of a new composition of matter gives only the names of the substances which are to be mixed together, without stating any relative proportion, undoubtedly it would be the duty of the court to declare the patent void. And the same rule would prevail where it was apparent that the proportions were stated ambiguously and vaguely. For in such cases it would be evident, on the face of the specification, that no one could use the invention without first ascertaining by experiment the exact proportion of the different ingredients required to produce the result intended to be obtained."

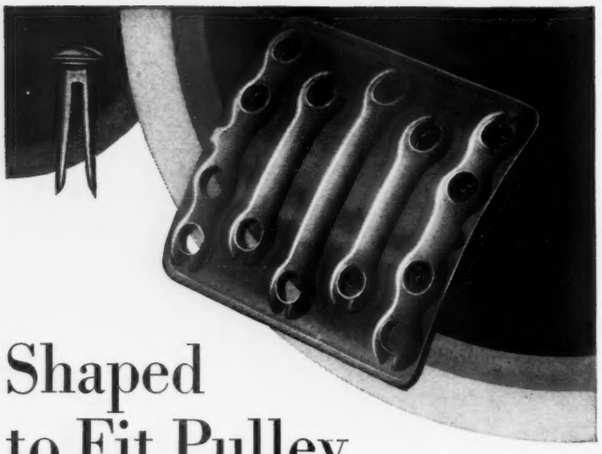
Concrete Mixer Held to be Dangerous to Traffic

It is well established law that an automobile driver is required by the law to exercise ordinary care to safeguard himself against injury by collision with any object left on a highway, irrespective of negligence of the person who obstructed the highway. However, if the jury decides that the injured automobile driver exercised ordinary care to prevent the collision he is entitled to recover damages. So held the higher Court in the late case of Wicker v. North States Construction Co., 235 N. W. 630.

The facts of this case are that a person negligently left a concrete mixer on a highway. The mixer had considerable dried concrete upon it, giving it much the same color as the highway and tending to destroy its discernibility. The testimony was that the color of the mixer was "of a neutral character such as not to make it conspicuous on the road."

One night an automobile driver, traveling at a normal rate of speed, collided with it and he was seriously injured. The jury held the owner of the mixer liable and the higher Court promptly upheld this verdict, saying:

"The jury was warranted in concluding that the difficulty in the instant case was that the object in the road was about the same color as the road, that it was so tall that its top did not outline against the horizon and was not reasonably discernible under the circumstances until within about 20 ft. therefrom. Indeed, there is nothing in the record to indicate that the driver could not have stopped his car within the radius of his lights. In this case it was permissible for the jury to conclude that no automobile light would have reasonably disclosed the obstruction. If so, it would seem to follow that the accident was not due to the driver's conduct or to the character of his lights."



Shaped to Fit Pulley

These improved belt plates are shaped to conform to the circumference of the pulley, and will not cut the belt. Each plate is marked for centering. The shape of the ribs makes it easy to extract rivets. Only tough, cold-rolled steel is used.

Bristol's rivets have sharpened, self-clinching points. Their beveled heads are easy to hold when extracting. Made of cadmium plated steel to resist rust.

Write for Bulletin 715-O

THE BRISTOL CO., Waterbury, Conn.

BRISTOL'S
BELT PLATES

Gold Medal Explosives

SHOW RESULTS AT THE OPERATION

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Try a Shot of Gold Medal

An Established Product for a Quarter of a Century

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ILLINOIS POWDER MFG. CO.
Incorporated in 1907
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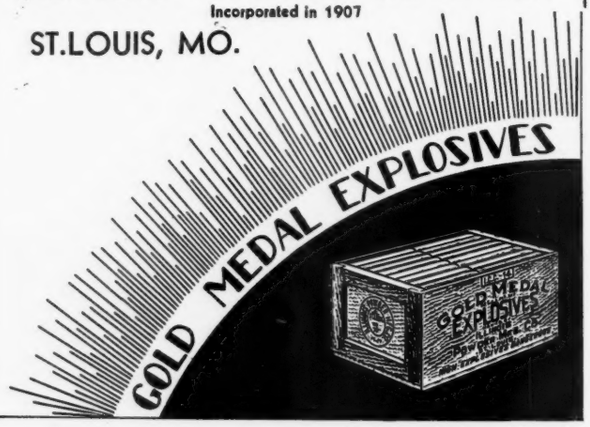

J&L WAREHOUSES

CHICAGO CINCINNATI
DETROIT NEW ORLEANS
PITTSBURGH

Louisville—Stock of Bars for Concrete Reinforcement and Bar Fabricating Yard.

Memphis—Distributing Warehouse for Pipe, Sheets, Spikes and Wire Products, Reinforcing Bar Warehouse and Fabricating Shop.

AND BE SURE

JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS
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Lewistown Foundry Products
ARE
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BUCKET ELEVATORS
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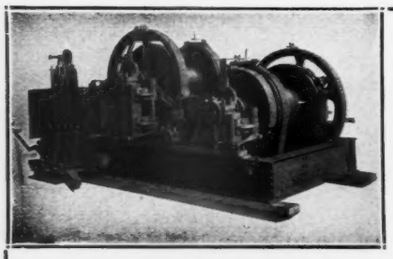
Lewistown Foundry & Machine Co.
Lewistown, Pa.



STREET

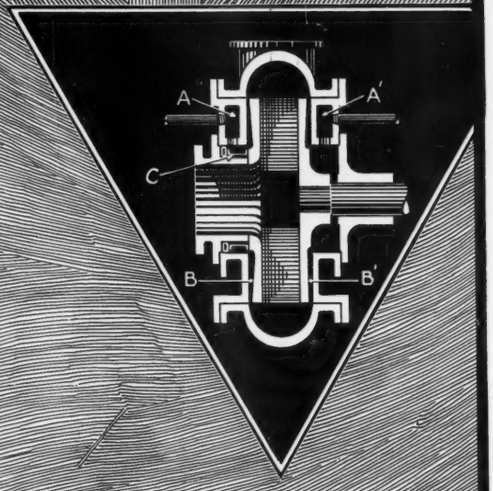
SLACKLINE HOISTS ARE KNOWN FOR DEPENDABILITY AND EASE OF OPERATION. THEY ARE BUILT WITH JUST AN ADDED TOUCH OF TOMORROW.

ASK FOR BULLETIN

HOISTS DERRICKS CABLEWAYS SLACKLINE EXCAVATORS

STREET BROS. MACHINE WORKS
Incorporated
CHATTANOOGA, TENN.

A Film of Water Cuts Maintenance to a Fraction



All parts of the Hydroseal Pump, exposed to the abrasive laden water being pumped, are made of a special alloy, so hard that it cannot be machined—it must be ground. But we do not rely so much on materials to provide long life, for we designed durability into the pump. The sides of the impeller and pump casing are hydrosealed against abrasion by means of clear water, which is piped to chambers A and A′ on both sides of the impeller. Due to the adhesion of this water to the sides of the impeller and because of the close clearance at B and B′, the initial low pressure of the clear water is boosted above the pressure in the main volute. The annular clearances B and B′ are thus continuously filled with clear water flowing into the volute, not abrasive laden water flowing in the opposite direction. Further, leakage through the sealing ring C is low pressure clear water only, not high pressure abrasive laden water. The pump can therefore maintain its initial efficiency and discharge pressure for an indefinite period. Our catalogue 331 fully describes this pump. Write for it and a list of installations in your vicinity. The Allen-Sherman-Hoff Co., 215 S. 15th St., Philadelphia. Offices in Principal Cities.

HYDRO SEAL